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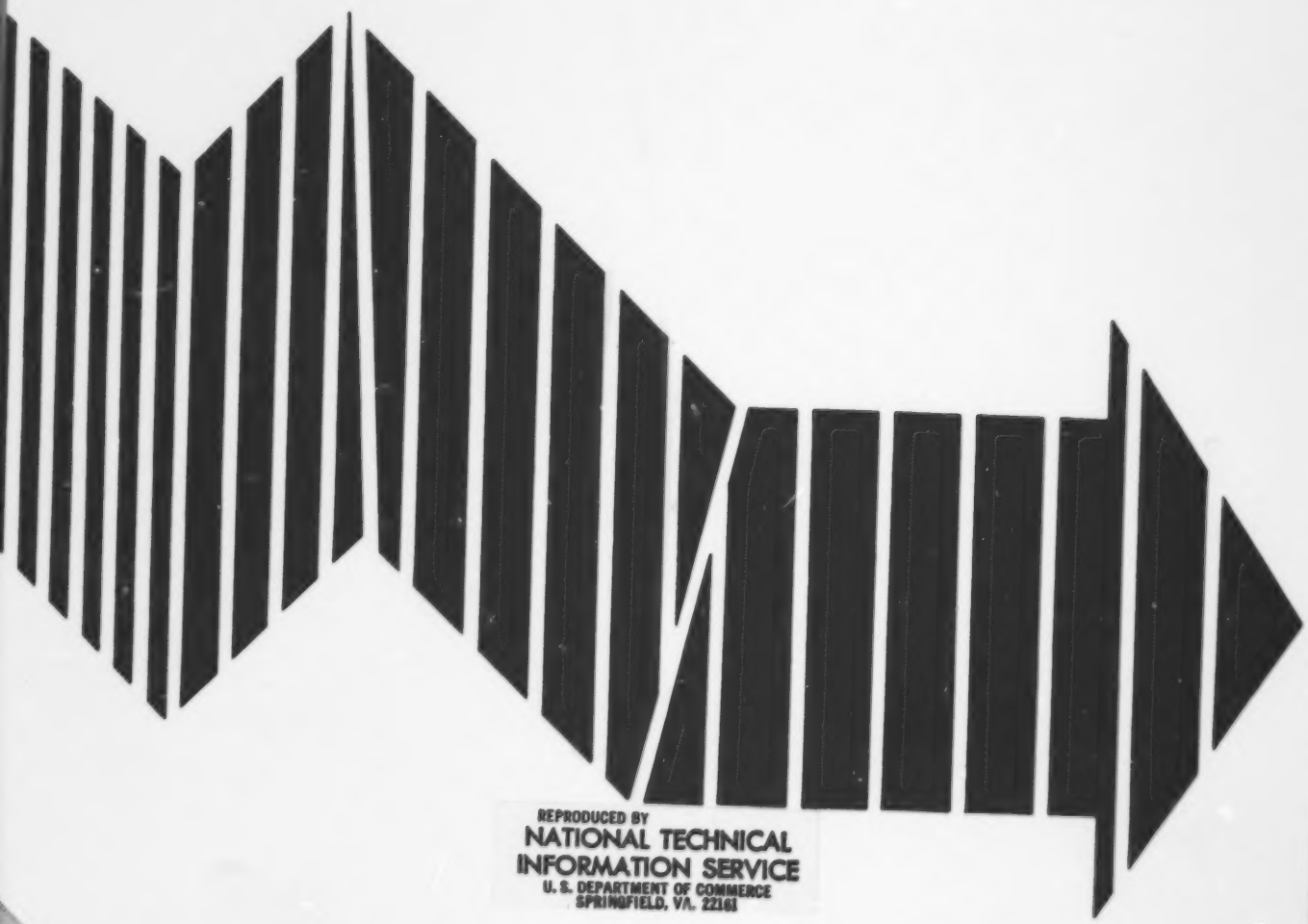

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This document contains projections of residuals from various energy and industrial activities which may enter the environment as an outcome of implementing the President's National Energy Plan (NEP) issued on April 29, 1977. The Strategic Environmental Assessment System (SEAS) was the comprehensive simulation model used to provide the projections.

The projections encompass regional breakdowns by source for various pollutants in air, water, and solid wastes, including toxic substances. The trends are expressed as 1985 and 1990 multiples of their respective 1975 values.

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ENVIRONMENTAL OUTLOOK, 1977

National, Regional, and Sectoral Trends and Forecasts 1975, 1985, 1990

by

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Office of Research and Development

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PREFACE

Environmental Outlook 1977 contains projections of data for residuals from a variety of energy and industrial activities. The residuals in question are problematic in that they might enter the environment should a series of hypothesized measures be chosen to implement the President's National Energy Plan (issued April 29, 1977). These projections were generated by a comprehensive simulation model developed by the U. S. Environmental Protection Agency (EPA)--the Strategic Environmental Assessment System (SEAS)--which has incorporated recent modifications and data files developed by the Energy Research and Development Administration (ERDA), now a part of the Department of Energy. The modifications and data files have also been used in ERDA's Environmental Assessment Report.

The projections in Environmental Outlook 1977 are based upon a number of assumptions regarding economic, environmental, and energy related decisions which may be made in the future. They are therefore to be taken as assessments of potential impacts, those which would occur should all assumptions become realities. Because of the complex and dynamic nature of interrelationships between energy, economic, and environmental issues, all assumptions, data, and projections derived from investigating the issues may change with time. As such, they must always be interpreted in the light of the most current information and policies.

ABSTRACT

This document contains projections of data for residuals from various energy and industrial activities. The residuals in question may enter the environment if a series of hypothesized measures are chosen to implement the President's National Energy Plan (issued April 29, 1977). These projections were generated by a comprehensive simulation model, the Strategic Environmental Assessment System (SEAS).

The data and projections are based on assumptions regarding future economic, energy, and environmental decisions. They encompass regional breakdowns by source for various pollutants in air, water, and solid wastes, including toxic substances. Trends are expressed as 1985 and 1990 multiples of their respective 1975 values.

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INTRODUCTION

Several approaches have been proposed as part of a plan to meet the Nation's energy needs. These include the increased use of coal by direct burning, the use of coal derived synthetic fuels and alternate sources of energy such as waste, solar, geothermal, and nuclear, and the implementation of more efficient energy extraction and use processes. Each of these approaches can significantly affect the relationship of energy supply, demand, and use to the economy and the environment.

ASSUMPTIONS

The scenario used in this report is based on projections and assumptions which simulate the President's National Energy Plan.[1] The Strategic Environmental Assessment System (SEAS) model was calibrated to simulate the macroeconomic levels, end-use energy demands, and energy supply assumptions; and further details and extensions were developed by the Energy Research and Development Administration (ERDA).

The scenario and resulting analysis are close to that which was reported in the Annual Environmental Analysis Report.[2] The differences between the two reports are due to assumptions about the future prices of commodities. These divergent assumptions result in differing output for individual economic sectors, primarily in a shift toward service industries in this document (Table 1). Variances in pollutant residuals are small, however.

Economic forecasts are based on official White House projections for 1980, Council of Economic Advisors and Project Independence Evaluation System forecasts to 1985 as used in the National Energy Plan analysis, and extensions of forecasts to the year 2000. Energy forecasts are based on the National Energy Plan, with additional details and projections to 2000 provided by the Energy Research and Development Administration.

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[1] Executive Office of the President, 1977. The National Energy Plan, Washington, D.C.

[2] Energy Research and Development Administration, 1977. Annual Environmental Analysis Report. Volume I. In Environmental Challenges of the President's Energy Plan: Implications for Research and Development. Report prepared for the Committee on Science and Technology, U.S. House of Representatives by the Congressional Research Service, Library of Congress, Washington, D.C.

Environmental control assumptions embodied in the residual coefficients are based on new source performance standards, State Implementation Plan standards, estimates of performance from standards development documents, and estimates for new energy technologies. For air, Best Available Control Technology levels are included for new power plants (after 1984) and industrial boilers (after 1979), assuming that scrubbers operate at 90 percent efficiency 90 percent of the time (81 percent overall). For water, waste discharge treatment to Best Available Treatment Economically Achievable levels is assumed to be achieved by 1985. The assumptions for residuals are reported in detail in Volume IV of the Annual Environmental Analysis Report.

Table 1

COMPARISON OF ENVIRONMENTAL OUTLOOK 1978-82 AND ANNUAL ENVIRONMENTAL ANALYSIS REPORT PROJECTIONS IN 1990

(10^6 Metric Tons)

	Environmental Outlook 1978-82	Annual Environmental Analysis Report	Difference, Percent
AIR			
Sulfur oxides	28.4	28.04	1
Total suspended particulate matter	10.2	10.1	1
Nitrous oxides	22.4	22.4	0
Hydrocarbons	9.6	9.4	2
Carbon monoxide	43.5	42.5	2
WATER			
Biochemical oxygen demand	1.45	1.46	1
Suspended solids	2.40	2.40	0
Dissolved solids	11.18	11.13	0.5

STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM

The system consists of more than 25 computer-linked models, including thousands of equations and data points. It starts with a set of macroeconomic forecasts for variables such as national personal disposable income and governmental purchases. These forecasts of the overall national economic activity are fed into demand equations and then into an input-output model that computes the values (in dollars) of the intersectoral flow of goods and services for 185 producing and consuming sectors of the economy. These projections of the national flow of goods and services can be targeted to be consistent with overall forecasts of national economic activity.

For any year of the projection, the gross amounts of various pollutants generated are calculated for each economic sector and for important process and product subsectors using average residual coefficients for each pollutant. These residual coefficients provide an estimate of the mass of pollutants generated per dollar of activity and may be changed to reflect new technology or abatement regulations.

The net residuals entering the environment resulting from national abatement policies are computed by reducing the specific residual coefficients for a sector in accordance with abatement assumptions. Residual coefficients are based on national averages and New Source Performance Standards for most sectors, but energy processes and industrial combustion processes are computed for each state based on State Implementation Plan standards. The corresponding net residuals and the cost and input requirements for the given level of abatement are then estimated.

Various special modules are used to provide the impacts of alternative policies on abatement costs, energy demands, solid waste generation and recycling, transportation demand, mineral use and virgin stock status, processed ore inventories, and land-use requirements. Provision is made for the outputs of some of these special models to influence the estimated national flows of goods and services; that is, the results are looped back to alter the output of the macroeconomic and the input-output models. In particular, the capital requirements of energy supply systems are calculated in detail and fed back to the economy as material demands.

Regional detail on economic activity is estimated with a special module that allocates the shares of national activity for each industry to counties and reaggregates to desired regional levels. The shares are based on existing levels, projections of future shifts, and manual overrides for industries where alternative projections appear warranted (e.g., energy and other major industries).

Pollutants are distributed regionally according to national pollution coefficients in most cases; however, coefficients for sulfur oxides and particulate matter are calculated for each state based on State Implementation Plan standards for combustion of coal and oil by power plants and 12 other major industries.

NATIONAL SOCIOECONOMIC TRENDS

To reduce the confusion produced by the use of many different units of measure for the various indicators of National growth, 1985 and 1990 values for the various parameters have been expressed as a multiple of their respective value in 1975. Thus, a number greater than 1.0 indicates an increase, while a number less than 1.0 indicates a lower value relative to 1975.

Whereas the National birthrate is declining such that our population may stabilize by the end of the century, the number of people in the Nation will continue to increase by about 1% per year through 1990, according to Bureau of Census projections. This means that there will be 245 million citizens by 1990, or about 32 million more than at present.

Economic forecasts assume an unemployment level of 4.6% by 1990, reflecting a healthy economy. If this goal is achieved, the Gross National Product will nearly double between 1975 and 1990.

The methodology used to arrive at the forecasts presented herein allows systematic disaggregation of this economic growth into over 350 economic sectors. Table 2 indicates the projected growth (in terms of value of output) of some aggregated sectors which are most relevant to environmental quality. For example, even with the assumed conservation rates in the National Energy Plan, the Nation will require about one and one-half times as much energy in 1990 as it is using now. A greater reliance on domestic energy sources (primarily coal) will result in the need for almost two and one-half times as much coal in 1990 as was mined in 1975.

In the cases where future air emissions are greater than in 1975, the amount of increase can be considered as economic growth which must be principally restricted to Class III PSD areas, or as emission reduction which must be achieved through the new "emissions offset" policy in nonattainment areas. In either water or air pollution control, if technological developments support periodic strengthening of "best available technology," projected future discharges could be reduced. However, only one or two cycles of this review and updating process could take place prior to 1985.

The increases in solid waste quantities may have both negative and positive consequences. Many solid wastes contain hazardous and toxic materials; thus, if they are ultimately disposed improperly on land, there is great potential for contamination of the land surface and underlying ground water aquifers. On the other hand, some solid wastes could be looked upon as growing sources of raw materials; for example, municipal solid waste may be recycled for energy and non-ferrous metals may be recovered.

In the case of energy mining wastes, the forecast assumes steady increase in surface mining reclamation, but that 100% successful reclamation will not be achieved until the year 2000.

The output of our Nation's chemical industry (which could be considered a rough indicator of toxic substance problems) grows much faster than does the population; it will nearly double by 1990. Agricultural output, which is related to nonpoint-source water pollution and pesticide problems, approximates the growth of population. This forecast incorporates export trends of the early 1970's but does not assume that the U.S. will be called upon to "feed the world" in the foreseeable future.

Assuming no catastrophic energy crises, transportation (as measured by vehicle-miles traveled) continues to grow faster than the population (i.e., at approximately the same rate as the national economy). Under the same energy assumptions, the automobile will continue to dominate passenger-miles traveled, providing 83% of the total in 1990 as compared to 86% in 1975.

Table 2

PROJECTION OF NATIONAL SOCIOECONOMIC TRENDS
AS A MULTIPLE OF 1975 VALUE

FACTOR	1985	1990
Population[1]	1.10	1.15
Gross National Product[2]	1.55	1.80
National Energy Demand	1.27	1.34
Coal Mined	1.93	2.41
Chemical Production	1.63	1.89
Agricultural Production	1.05	1.12
Vehicle Miles Travelled (all forms)	1.54	1.77

[1]Population Forecast: Series E Forecast

[2]GNP Growth Rates: 1975-1985 - 4.49%
1985-1990 - 3.05%

TRENDS IN NATIONAL DISCHARGE OF POLLUTANTS

The attainment of improved ambient environmental quality by the application of a fixed set of emission and effluent controls is not an ultimate solution in a growing economy. As the economy expands, the amount of pollution discharged will grow due to the increased utilization of existing production capacity and the addition of new sources. If "best available" technology advances toward "zero discharge," a steady decrease in the discharge of all regulated pollutants could be achieved. However, with zero discharge, most of the pollutants are removed from the airborne or waterborne phase as solid wastes, which must be dealt with through some form of land disposal or, more ideally, through beneficial reuse. If not prudently managed, these captured residuals can become secondary air and water pollution problems. These concepts are shown graphically in Figure 1.

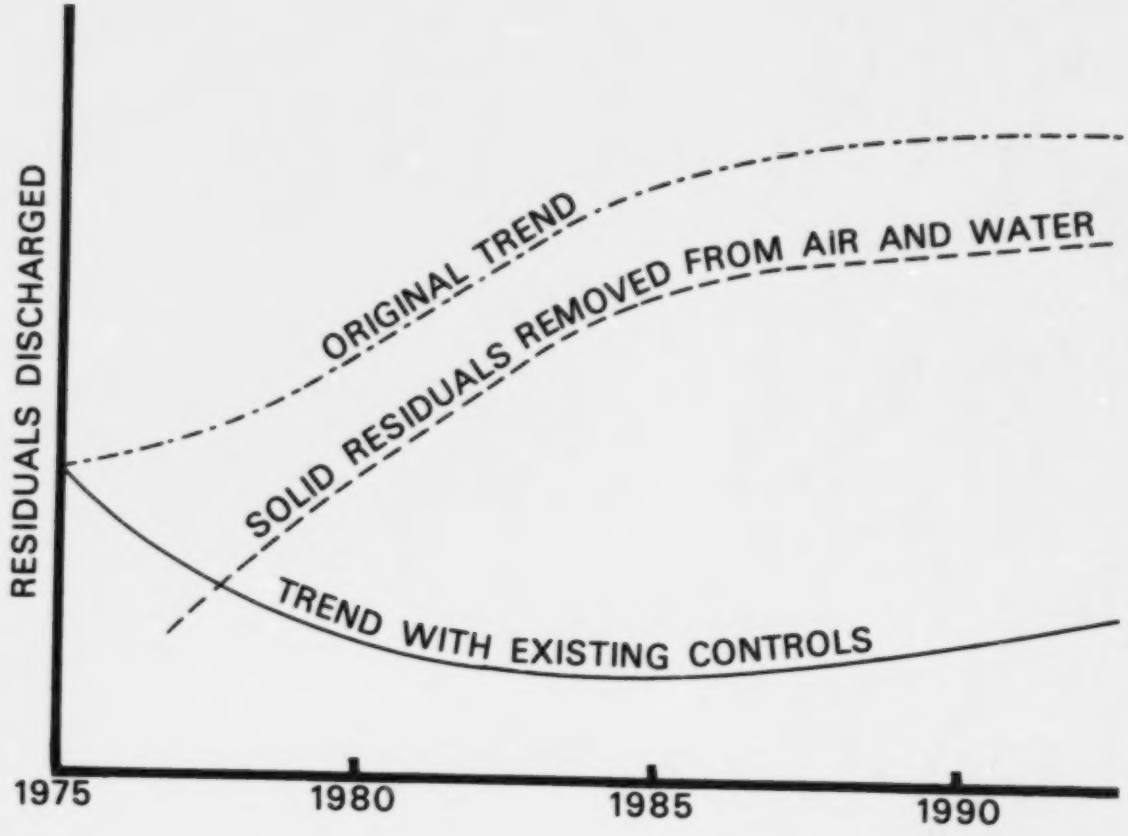


Figure 1. Impact of fixed-level discharge controls in a growing economy.

NATIONAL POLLUTION FORECASTS: 1985 AND 1990

Figure 2 presents the trends of the national total discharge of some common residuals to air, water, and land. It indicates that with existing control regulations, the Nation will already be experiencing an increasing rate of pollution for many of the residuals by 1990. For water, all discharges will be far below 1975 levels; for air, however, the total quantity of sulfur and nitrogen oxides will actually be above 1975 levels in both 1985 and 1990. Since auto emission control advances apply only to new vehicles, a downward emissions trend is still present for hydrocarbons and carbon monoxide in 1990. As is the case with point sources, it takes a period of time for older vehicles without new emission controls, to be phased out. Because solid wastes are not "cleaned" or transformed in the sense that effluents and emissions are, their quantity is always shown to be growing in this report. Since captured air and water residuals are increasingly added to the solid waste tally, the quantities are growing much more rapidly than the population. Due to the lack of data, the impacts of non-point sources of water pollution and fugitive dusts were not estimated, and only very limited forecasts for non-criteria air pollutants and toxic materials were attempted.

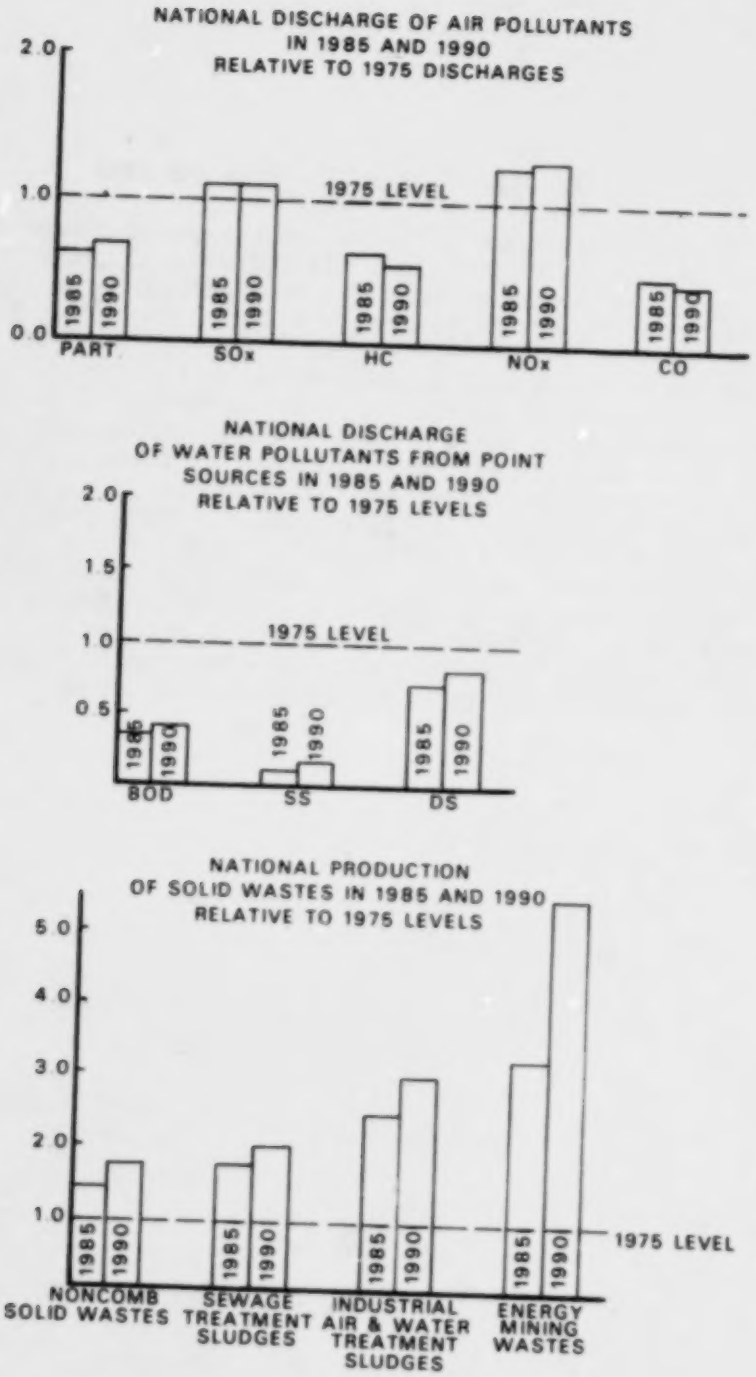


Figure 2. Trends of national total discharge of some common residuals to air, water, and land.

TRENDS IN INDUSTRIAL OUTPUT

Since control strategy for point sources is normally focused on particular sectors of the economy, the anticipated national economic growth as it drives the outputs of these sectors becomes a critical factor in anticipating future pollution loading. The sectors chosen for analysis, as a group, normally account for about 90% of the residuals generated from point and mobile sources. Exceptions are in TSP (60%) and noncombustible solid waste (80%).

The most interesting facet of the decision to sort by major polluting sectors is that in toto they account for a little less than 40% of the total output of the economy. Only the fabrication industry produces more than 5% of the total national output in the year 1990 (17%). Because of this fact, pollution control aimed at major polluting sectors does not normally show a significant impact on the Gross National Product, although the economic impact may affect the individual sectors themselves.

Most of the sectors are expected to grow fairly consistently throughout the 15 year period, except that iron and steel and petroleum and natural gas are projected to level off between 1985 and 1990. Food processing, on the other hand, will double its growth rate.

Table 3

INDUSTRIAL OUTPUT

As % of 1975 Value and as the Share
of 1990 Total Output
(Output Measured in Dollar Value)

Sector	Multiple of 1975 Value		% of Total Output	
	1985	1990	1985	1990
Iron and Steel	1.25	1.27	1.52	1.33
Non-ferrous Metals	1.67	1.95	.94	.95
Pulp and Paper	1.40	1.57	1.40	1.36
Chemicals	1.63	1.89	3.57	3.57
Electric Utility	1.86	2.20	2.02	2.07
Petroleum and Natural Gas	1.22	1.25	2.91	2.58
Food Processing	1.11	1.23	4.92	4.72
Fabrication and Basic Products	1.76	2.04	17.29	17.29
Coal Mining	1.93	2.41	0.34	0.37
Transportation	-	-	4.06	4.05
All Other Sectors	1.62	1.90	61.09	61.79
Total Output	1.58	1.83	100.	100.

INDUSTRIAL SECTOR RESIDUAL ANALYSIS

The industrial sectors were chosen on the basis of their contribution to the total pollution load of the Nation. The sets presented are those sectors which account for the major percentage of pollution generated in any particular year.

Again, recognizing the growing numbers of sources and the phased legislated restrictions on residual discharges (Table 4), we find that discharge of water pollutants is much lower in the future for all sectors except those related to energy production. However, in most cases, the 1985-1990 increment shows an increase, suggesting a need for a new control strategy that goes beyond current BAT requirements.

The air emissions picture is not as hopeful, with emissions in 1985 already exceeding that of 1975 for all of the selected pollutants in one or more of the selected industrial sectors. This indicates a real challenge for improved control technology, production process modification or, as a last resort, regional emission offsets to compensate for these sectors in many areas of the country.

Solid wastes (Table 5) are expected to be steadily increasing since this analysis does not forecast beneficial recycling nor conversion to other forms. The significant increases here are in the industrial sludges and energy mining wastes categories. Industrial sludges result from the capture of airborne and waterborne pollutants. For example, a four-fold increase in this type of pollutant is projected in the electric utility category due to the utilization of sulfur oxide scrubbers (assuming non-regenerative scrubbers as BACT). Much of the increase in mining wastes is due to coal mining, as expected, but a much greater share of the rate of growth is exhibited by the oil shale processing industry if it is developed as proposed in the National Energy Plan.

For more details on Sectoral Analysis, see Appendix A.

Table 4

NATIONAL DISCHARGE OF RESIDUALS BY SECTOR

1985 and 1990 Values
Multiple of 1975 Value

	Waterborne						Airborne									
	BOD		SS		DS		Part.		SO_x		NO_x		HC		CO	
	85	90	85	90	85	90	85	90	85	90	85	90	85	90	85	90
Iron and Steel	.16	.18	.003	.003	.77	.78	1.16	1.22	.39	.42	1.60	1.86	2.64	2.87	1.04	1.05
Non-ferrous Metals			.00	.00	.81	.97	1.63	2.04	.30	.29						
Pulp and Paper	.18	.18	.25	.24			.57	.55	1.45	1.39					1.45	1.39
Chemicals	.14	.17	.35	.42	.54	.63	.85	.94	.79	.90	1.22	1.34	1.53	1.68	1.65	1.93
Electric Utilities			1.80	1.93	1.32	1.44	.37	.38	1.09	1.08	1.37	1.45	1.72	2.22	1.87	3.11
Petroleum and Natural Gas	.30	.29	.00	.00			1.18	1.29	.99	.97	1.09	1.05	1.10	1.06	1.15	1.15
Coal Mining	-	-	.009	.01	1.37	1.48	1.69	1.91	1.88	2.51	2.48	3.30	1.76	2.04	1.47	1.73
Food Processing	.24	.30	.17	.20	-	-										
All Other Sources	.48	.52	.38	.40	1.54	.87	.65	.71	1.47	1.50	1.19	1.25	.57	.50	.46	.41
Total Sources	.35	.24	.11	.16	.71	.80	.61	.66	1.09	1.09	1.24	1.30	.63	.57	.51	.47

Table 5

NATIONAL DISCHARGE OF SOLID WASTES* BY SECTOR

1985 and 1990 Values
Multiple of 1975 Value

Sector	NCSW		MW		IS		SS	
	85	90	85	90	85	90	85	90
Iron and Steel	1.81	1.86	-	-	1.53	1.56		
Non-ferrous Metals	2.18	2.72	-	-	-	-		
Pulp and Paper	1.52	1.46	-	-	1.58	1.67		
Chemicals	1.34	1.51	-	-	1.50	1.64		
Electric Utilities	1.62	1.41	-	-	3.90	4.40		
Petroleum and Natural Gas	1.38	1.37	-	-	1.70	1.77		
Food Processing	-	-	-	-	1.46	1.61		
Coal Mining	-	-	1.85	2.13	-	-		
All Other Sources (Including Oil Shale)	2.03	2.57	6.63	14.94	4.96	8.15		
Total Output	1.70	1.83	3.11	5.50	2.50	2.97	1.83	1.98

*NCSW = Non-combustible solid wastes
MW = Mining wastes
IS = Industrial sludges
SS = Municipal sewage sludges

DISCHARGES OF TOXIC MATERIALS

The current data base for forecasting future toxic materials released to the environment covers only a handful of the many toxic chemical compounds currently being utilized in industrial, commercial and consumer applications. Most of the toxics presently in the forecasting system are metals.

Of the airborne metal discharges considered (Table 6), the most serious potential problems are related to increased combustion of coal by electric utilities and industrial boilers. Forecasts are made based on measured content of metals such as cadmium, lead, mercury, chromium, zinc and nickel in typical coals which would be burned in different regions. Assuming these concentrations in the discharge of fine particulates which would escape "best available" control technology (99.5% removal), 1990 national discharges of these six metals range from 2 to over 4 times as much as comparable 1975 values.

Most of the commonly known toxic metals in liquid discharges (Table 7) will be well controlled if BAT controls are installed as called for in P.L. 92-500 and as defined in EPA Effluent Guidelines. Coal mine tailing leachates are an exception to this general downward trend. Of course, many organic toxics present in industrial effluents were not addressed by the first-round guidelines; hence, the current effort of analyzing the need for effluent limitations for 65 important waterborne toxics as defined in the "consent decree."

The fact that the chemical production in the U.S. is projected to grow faster than the population and many other economic sectors is a general indicator that the toxics problem will be one of increasing potential. Current industry growth forecasting capabilities, combined with the nonclassified portion of the proposed new toxics information system being developed by the Office of Toxic Substances (OTS), should prove to be a powerful tool in further delineating this current and future problem.

Table 6

DISCHARGE OF SELECTED TOXIC MATERIALS
TO AIR FROM SELECTED SOURCES

1990 Value Relative to 1975
Share of 1990 National Total in Parenthesis

	Arsenic	Cadmium	Chromium	Lead	Mercury	Zinc	Nickel
Food Processing	1.59 (*)	1.59 (*)					
Industrial Chemicals					1.09 (.40)		
Non-ferrous Metals				1.98 (.61)		.90 (.04)	
Electric Utility		.40 (.31)	1.65 (.33)	.30 (.07)	2.04 (42)	.66 (.33)	.91 (47)
Industry Combustion	.72 (.99)	1.35 (.69)	4.40 (.67)	2.14 (.31)	3.82 (.18)	1.62 (.63)	2.16 (.53)
Coal Mining	NC	NC	NC	NC	NC	NC	NC

*Share is less than .01

NC-Not calculated. 1975 value is very small relative to 1990

Table 7

DISCHARGE OF SELECTED TOXIC MATERIALS TO WATER
FROM SELECTED SOURCES

1990 Value Relative to 1975

	Cadmium (DS)	Chromium (DS)	Lead (DS)	Mercury (DS)	Zinc (DS)	Cyanide (DS)	Fluoride (DS)	Titanium Oxide (SS)	Titanium Oxide (DS)	Nitrates (N)	Phosphates (N)	Ammonia (N)
Industrial Chemicals		1.70		.07				.24	.01	1.80	.00	
Other Chemical Products		.00			1.49			.00				
Non-ferrous Metals	.08		.00	.02	.02		.05	.00				
Steel		.29	.05		.04	.09	.33			.04	.50	.00
Municipal										.71	.74	
Fabrication	.00	.00			.00	.00					.00	

.00 = Value in 1990 is reduced to negligible amount from 1975 value

REGIONAL RESIDUALS ANALYSIS

From the regional disaggregation of the economic and population data, quantities of polluting activities can be projected (Table 8), giving a picture of where the various residuals would be emitted if the Nation's future unfolds according to forecast.

Figures 3 through 5 show both the relative share of the total pollution in 1990 (pie diagram) and the growth of pollution generation from 1975 to 1990 (shading).

Air pollution (Figure 3) (TSP, SO_x and NO_x) will still be concentrated in the Northeast in 1990, as it was in 1975. However, the relative growth in TSP and SO_x is greater in the Southwest and Southeast. The greatest relative changes in both TSP and SO_x are in the Southwest. The industries responsible for the growth are principally industrial combustion, and to a lesser extent, electric utilities, coal mining, and transportation.

Water pollution (Figure 4) in the Nation is concentrated in the Northeast. The greatest relative growth in all areas is in dissolved solids. The growth in the Southwest and Northwest (greatest of all) is a function of the expansion of the electric utility, coal mining, and chemical industries in these areas.

Solid waste (Figure 5) is growing nationwide. The sludge problem is greatest in the Northeast, due to high levels of industrialization and the higher sulfur content of coal burned there. The mining waste increases from energy production are notable in the Northwest, an area where reclamation may be problematical.

In a few cases, the rates of change for particular pollutant loadings were relatively large or small in one region compared to another. In these instances, further analyses were carried out to pinpoint the probable industrial sectors causing such aberrations. For example, growth of SO_x in the Southwest in 1990 is 1.87 times the 1975 value. This projection stands out sharply when compared to the rest of the regions which grow at only 20 to 25 percent from 1975 to 1990. Detailed analysis indicates that the accelerated growth of SO_x emissions in the Southwest is attributable to three industries: electric utilities, coal mining, and industrial combustion.

For further details on regionalization, see Appendix B.

Table 8

REGIONAL SOCIOECONOMIC TRENDS;
1990 VALUE RELATIVE TO 1975 VALUE AND
SHARE OF 1990 OUTPUT IN PARENTHESES

	Total	NE	SE	SW	NW
Population	100(100)	1.13(.47)	1.22(.17)	1.16(.21)	1.30(.15)
Manufacturing Output	1.76(.38)	1.71(.58)	1.92(.17)	1.86(.16)	1.67(.09)
Coal Mined	2.42(.004)	2.35(.40)	2.48(.54)	3.07(.02)	2.49(.04)
Agriculture Output	1.12(.03)	1.07(.29)	1.13(.20)	1.16(.34)	1.10(.17)
Energy Related Output	1.59(.05)	1.92(.54)	2.15(.08)	1.36(.28)	1.68(.10)
Total Output	1.83(100)	1.73(.55)	1.87(.16)	1.71(.19)	1.63(.10)

NE - Region I, II, III, V

SE - Region IV

SW - Region VI, IX

NW - Region VII, VIII, X

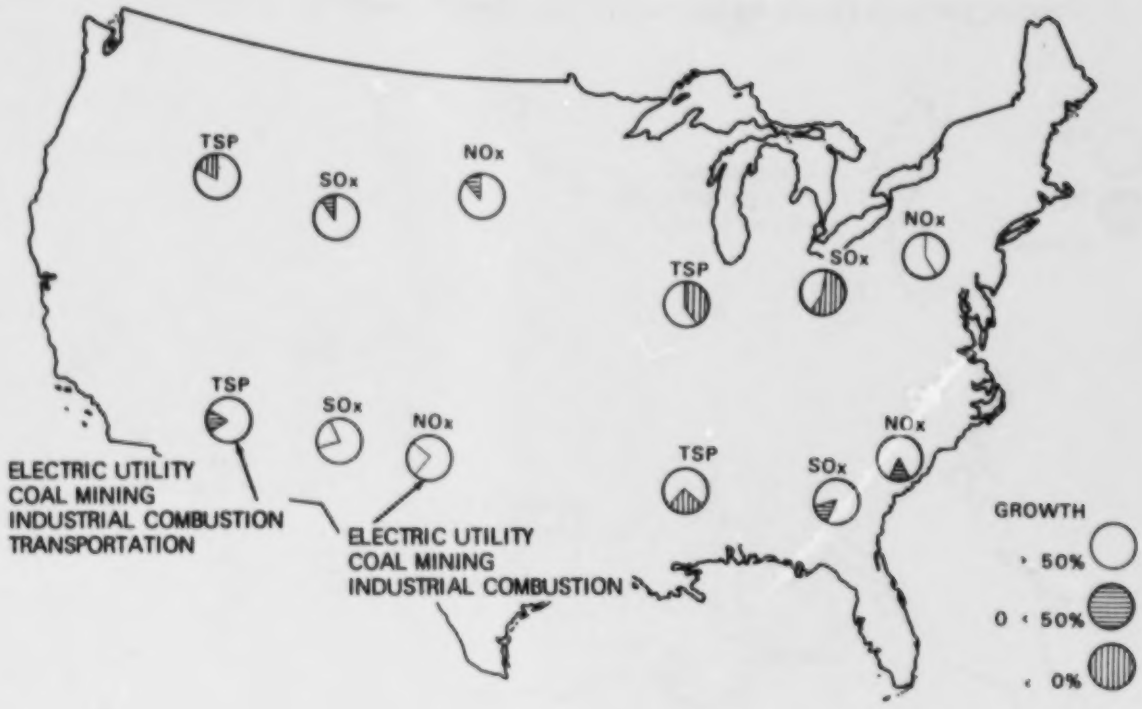


Figure 3. Regional growth in pollutants in 1990 (air pollution).

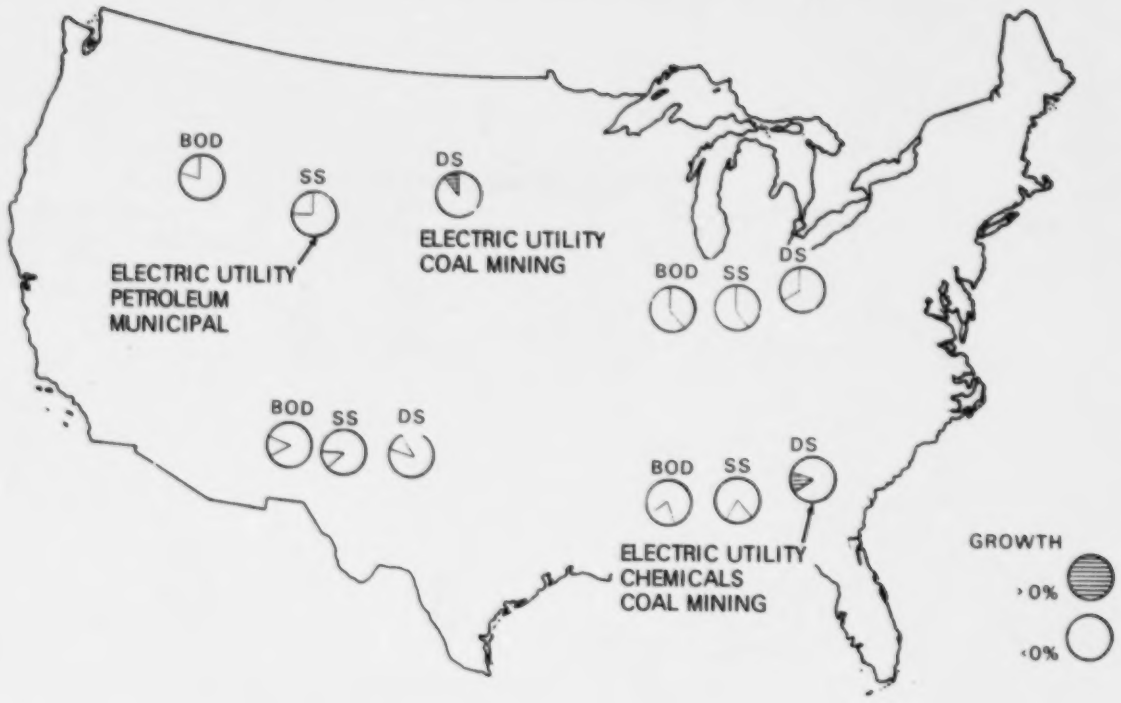


Figure 4. Regional growth in pollutants in 1990(water pollution).

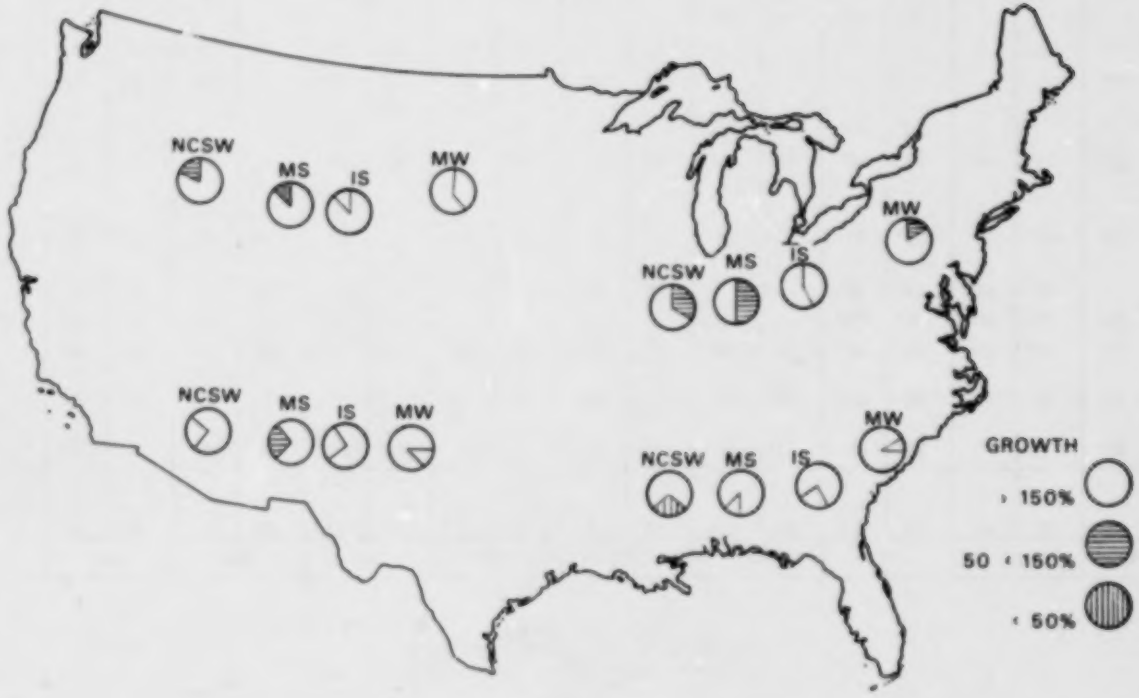


Figure 5. Regional growth in pollutants in 1990(solid waste).

Appendix A

BACKGROUND DATA FOR INDUSTRIAL SECTOR ANALYSES

Table A-1

FRACTION OF NATIONAL TOTAL POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES

	TSP		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		IS	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Pulp & Paper	.02	.01	.00	.00	.00	.00	-	-	.01	.04	.23	.11	.06	.08	-	-	.02	.02	.06	.03
Industrial Chemicals	.01	.01	.02	.01	.00	.00	.06	.12	.00	.01	.12	.05	.02	.04	.71	.56	.18	.15	.21	.21
Other Chemical Steel	.08	.01	.00	.00	.00	.00	.00	.01	.04	.10	.00	.00	.29	.00	.03	.00	.02	.02	.10	.05
Non-Ferrous Metals	.01	.04	.09	.02	.00	.01	-	-	-	-	-	-	.08	.00	.00	.00	.05	.08	-	-
Coal Mining	.03	.08	.00	.00	.02	.01	.00	.01	.00	.00	-	-	.25	.02	.17	.31	-	.03	-	-
Petroleum & Natural Gas	.03	.07	.06	.05	.09	.07	.04	.08	.01	-	.01	.00	.11	.36	-	.00	.12	.09	.22	.13
Other Petroleum Products																				
Electric Utilities	.21	.12	.60	.59	.29	.33	.00	.02	.00	.02	.00	.00	.04	.06	.07	.12	.37	.29	.28	.42
Food Processing	-	-	-	-	-	-	-	-	-	-	.08	.06	.02	.02	-	-	-	-	.05	.02
Industrial Conbustion	.10	.17	.16	.25	.09	.16	.00	.02	.00	.01	-	-	-	-	-	-	.04	.13	-	-
Transportation	.06	.15	.02	.03	.45	.38	.72	.61	.91	.79	-	-	-	-	-	-	-	-	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.45	.56	.11	.37	-	-	-	-	-	-
Other	.45	.42	.06	.03	.06	.02	.12	.14	.02	.01	.11	.21	.06	.05	.01	.01	.16	.21	.09	.22

Appendix B

BACKGROUND TABLES FOR REGIONAL ANALYSIS

Table B-1
FUTURE DISCHARGE OF SELECTED POLLUTANTS BY MAJOR U.S. REGION
1985 and 1990 Values as a Multiple of 1975

	NE		SE		SW		NW	
	85	90	85	90	85	90	85	90
Air								
SO_x	1.02	1.00	1.17	1.16	1.72	1.87	1.26	1.26
NO_x	1.14	1.57	1.27	1.32	1.40	1.54	1.34	1.42
HC	.62	.55	.64	.57	.67	.60	.64	.56
TSP	.51	.54	.60	.67	.94	1.07	.10	.12
CO	.50	.46	.51	.47	.51	.47	.48	.43
Water								
BOD	.37	.39	.36	.40	.35	.38	.32	.34
SS	.07	.10	.10	.14	.13	.16	.27	.54
DS	.66	.73	1.10	1.30	.45	.59	1.84	2.05
Land								
Non-Combustible Solid Waste	1.60	1.56	1.40	1.44	2.07	2.52	2.13	2.32
Mining Waste	1.59	1.69	2.12	2.61	3.89	5.61	9.44	23.71
Industrial Sludge	2.26	2.60	2.72	3.27	2.98	3.96	2.64	3.00
Sewage Sludge	1.75	1.85	2.18	2.64	1.80	1.91	2.00	2.10

Table B-2

ANALYSIS OF GROWTH OF DISCHARGE OF SELECTED POLLUTANTS
FROM SELECTED SOURCES IN THE FOUR MAJOR REGIONS

1990 Value as a Multiple of 1975

Sector	SW/SO_x	SW/TSP	SE/DS	NW/DS	NW/SS
Iron and Steel	.55	.18	-	-	.005
Non-Ferrous	.23	2.09*	-	-	.09
Pulp and Paper	1.41	.52	-	-	.23
Chemicals	1.04	1.23	1.42*	.39	.79
Electric Utility	7.75*	2.06*	1.27*	2.27*	2.15*
Petroleum	.89	1.09	-	-	.93*
Coal Mining	5.44*	2.40*	1.45*	5.85*	-
Industrial Combustion	2.72*	5.36*	-	-	-
Transportation	1.66	2.04	-	-	-
Food Processing	-	-	-	-	.12
Municipal	-	-	-	-	.58*
All Other Sources	.76	.65	2.03*	.01	.14
TOTAL CHANGE FOR ALL SOURCES	1.87	1.07	1.30	2.05	.54

*Greater than Total Source Change

Table B-3

FRACTION OF NATIONAL TOTAL POLLUTANT DISCHARGE RELEASED TO FOUR MAJOR REGIONS

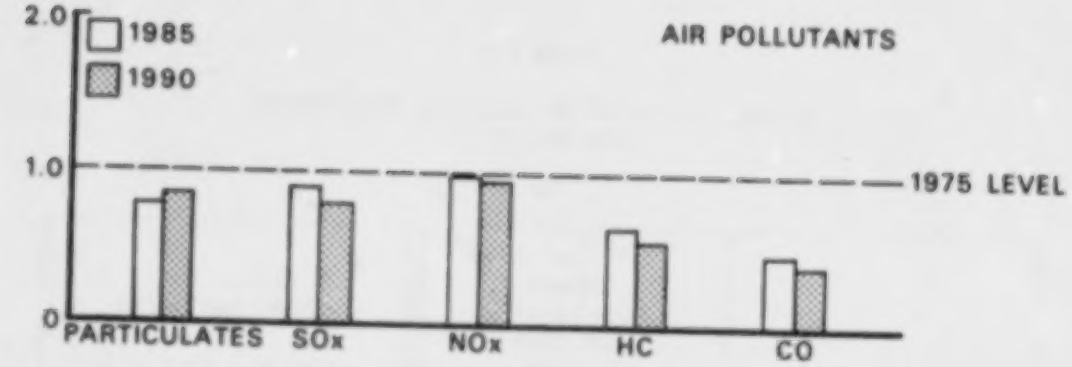
	NE	SE	SW	NW
Air				
TSP	.41	.21	.22	.16
SO_x	.54	.20	.16	.10
NO_x	.45	.18	.25	.11
HC	.44	.16	.28	.12
CO	.54	.20	.19	.08
Water				
BOD	.46	.18	.20	.16
SS	.43	.16	.16	.25
DS	.71	.12	.06	.09
Land				
NCW	.34	.22	.31	.13
MW	.16	.09	.16	.60
IS	.48	.23	.18	.11
SS	.50	.14	.23	.12

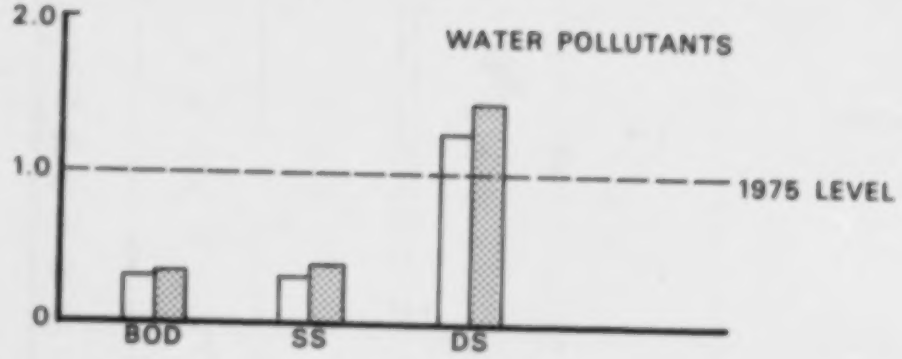
Appendix C

SOURCES OF INFORMATION

Economic	- Forecasts are based on official White House projections 1985 and 2000, PIES and Council of Economic Advisors (CEA) to 1985; ERDA to 2000.
Energy	- Forecasts based on the National Energy Plan (NEP), PIES and ERDA.
Environment	- EPA assumptions for control technology (BACT assumes scrubbers at 90% efficiency operating 90% of the time). EPA and ERDA coefficients for residual generation.
Regionalization	- OBERS, (Regional forecasts to the county level) plus ERDA and NEP assumptions for energy supply.

Overall Methodology - The Strategic Environmental Assessment System (SEAS) as modified by ERDA's Annual Environmental Analysis Report (AEAR).





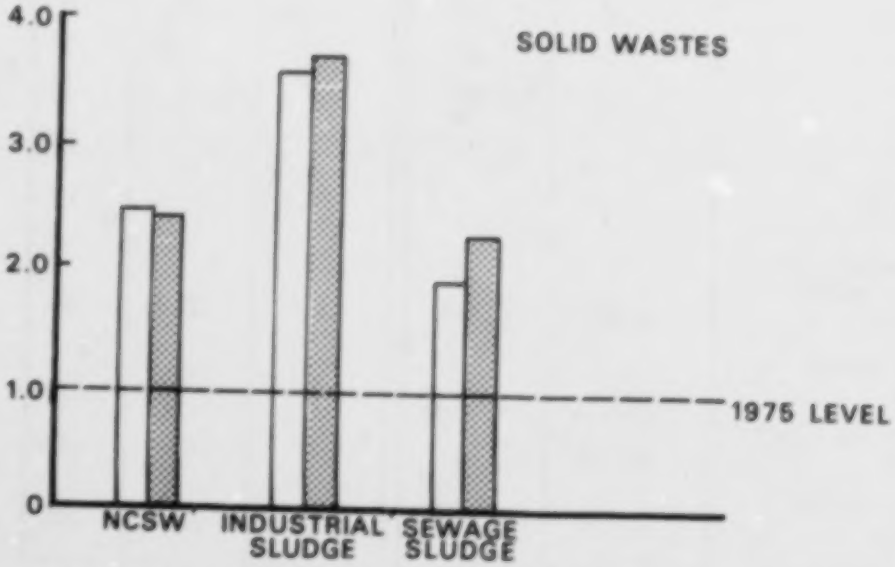


Figure C-1. Region 1 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-1

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION I

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.78*	.81	.02	.02	.02
SO_x	.87	.80	.03	.02	.02
NO_x	.99	.96	.04	.03	.03
HC	.61	.52	.05	.04	.04
CO	.43	.38	.05	.04	.04
Water					
BOD	.29	.33*	.07	.06	.06
SS	.27*	.34*	.02	.05	.04
DS	1.26*	1.42*	.07	.12	.12
Solid Waste					
Non-Combustible Solid Waste (NCSW)	2.43*	2.35*	.01	.01	.01
Mining Waste (M-W)	-	-	-	-	-
Industrial Sludge (I-S)	3.52*	3.68*	.02	.03	.03
Sewage Sludge (S-S)	1.88*	2.23*	.03	.03	.03

*Greater than national pollutant ratio

Table C-2

FRACTION OF REGION 1 POLLUTANT DISCHARGE
CONTRIBUTED BY SELECTED SOURCE CATEGORIES[+]

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.04	.06	.03	.03	-	-	-	-	-	-	.04	.01	-	-
Pulp & Paper	.03	.03	*	.01	-	-	-	-	.01	.03	.34	.15	.23	.14	-	-	.07	.04	-	-	.14	.05	-	-
Industrial Chemicals	*	*	*	*	-	-	*	*	*	*	.05	*	.01	*	.97	.98	-	-	-	-	.01	.01	-	-
Other Chemical Products	*	*	-	-	*	*	.08	.16	-	-	.09	.08	.05	.10	.01	0	-	-	-	-	.10	.07	-	-
Steel	*	*	*	*	*	*	*	*	*	*	*	*	.01	*	.01	*	*	*	-	-	.01	*	-	-
Crushed Stone	.07	.02	-	-	-	-	-	-	-	-	-	-	*	0	*	0	.51	.34	-	-	.04	.01	-	-
Non-ferrous Metals	*	*	-	-	-	-	-	-	-	-	-	-	.01	0	*	0	*	*	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	.03	.02	-	-
Coal Mining	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crude Petroleum & Nat. Gas Mining	-	-	*	*	*	*	*	*	*	*	-	-	0	.18	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	0	*	*	0	*	0	.01	0	*	.01	-	-	.17	0	-	-	.19	.12	-	-	.28	.12	-	-
Electric Utilities	.03	.05	.65	.61	.35	.32	*	.01	*	.01	*	*	*	.02	.01	.02	.22	.40	-	-	.08	.45	-	-
Industrial Combustion	.10	.10	.12	.11	.04	.06	*	.01	*	*	-	-	-	-	-	-	.01	.10	-	-	0	.11	-	-
Municipal	.05	.04	-	-	-	-	-	-	-	-	.31	.53	.27	.45	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.16	.34	.02	.05	.48	.50	.75	.63	.98	.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.55	.42	.20	.22	.12	.11	.16	.19	*	.01	.17	.18	.24	.08	*	*	*	*	-	-	.28	.11	-	-

[+]Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-3

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 1

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.51	.36	-	-	-	-	-
Pulp & Paper	.76	1.18	-	-	1.18	.14	.21	-	1.22	-	1.45	-
Industrial Chemicals	NG	NG	-	NG	NG	.03	.11	1.44	-	-	2.84	-
Other Chemical Products	NG	-	NG	1.14	-	.29	.71	0	-	-	2.39	-
Steel	NG	NG	NG	NG	NG	NG	.01	*	NG	-	2.06	-
Crushed Stone	.18	-	-	-	-	-	NG	NG	1.55	-	1.33	-
Non-ferrous Metals	NG	-	-	-	-	-	0	NG	NG	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	2.42	-
Coal Mining	-	-	-	-	-	-	-	-	-	-	-	-
Crude Petroleum & Nat. Gas Mining	NA	NG	NG	NG	NG	-	NA	-	-	-	-	-
Petroleum Processing	1.20	NG	NA	0	1.55	-	0	-	1.56	-	1.56	-
Electric Utilities	.80	.75	.89	1.25	1.38	NG	4.22	3.15	4.24	-	20.39	-
Industrial Combustion	.68	.74	1.50	1.58	NG	.56	-	-	22.53	-	NA	-
Municipal	-	-	-	-	-	-	.58	-	-	-	-	2.23
Transportation	1.72	1.83	.99	.44	.37	-	-	-	-	-	-	-
Other	.62	.86	.90	.63	1.05	.35	.11	NG	NG	-	.45	-
Total for Region 1	.81	.80	.96	.52	.38	.33	.34	1.42	2.35	-	3.68	2.23

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

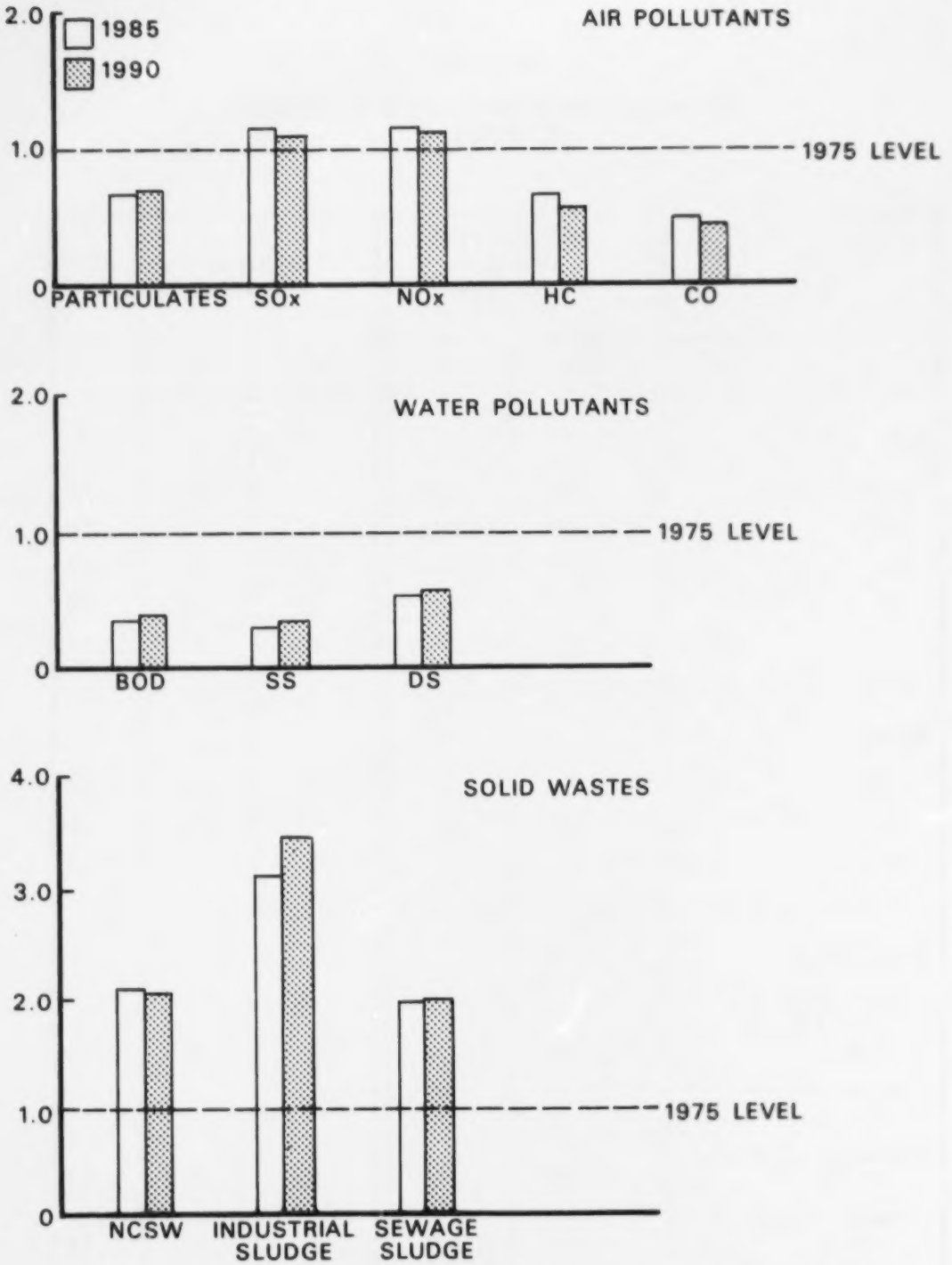


Figure C-2. Region 2 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-4

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 2

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.67*	.68*	.05	.06	.05
SO_x	1.17*	1.09*	.06	.07	.06
NO_x	1.14	1.13	.08	.07	.07
HC	.63	.56	.08	.08	.08
CO	.47	.42	.08	.07	.07
Water					
BOD	.33	.35*	.14	.13	.13
SS	.28*	.31	.04	.10	.08
DS	.49	.54	.19	.13	.13
Solid Waste					
Non-Combustible Solid Waste (NCSW)	2.08*	2.02*	.03	.04	.03
Mining Waste (M-W)	-	-	-	-	-
Industrial Sludge (I-S)	3.05*	3.45*	.08	.10	.10
Sewage Sludge (S-S)	1.97*	1.99*	.11	.12	.11

*Greater than national pollutant ratio

Table C-5

FRACTION OF REGION 2 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.03	.03	.03	.02	-	-	-	-	-	-	.03	.01	-	-
Pulp & Paper	*	*	*	*	-	-	-	-	*	*	.05	.04	.05	.04	-	-	*	*	-	-	.02	.01	-	-
Industrial Chemicals	*	*	.01	*	*	*	*	*	*	*	.05	*	.03	.01	.94	.94	.10	.07	-	-	.45	.17	-	-
Other Chemical Products	.01	.01	-	-	*	*	.09	.16	-	-	.08	.06	.04	.09	.03	0	-	-	-	-	.06	.04	-	-
Steel	.07	.01	*	*	*	*	*	*	.04	.08	*	*	.04	*	.01	*	.03	.03	-	-	.06	.03	-	-
Crushed Stone	.02	*	-	-	-	-	-	-	-	-	-	-	*	0	*	0	.17	.15	-	-	-	-	-	-
Non-ferrous Metals	*	*	.02	*	-	-	-	-	-	-	-	-	*	*	*	*	*	*	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	.02	.01	-	-
Coal Mining	.01	.03	*	*	*	*	*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crude Petroleum & Nat. Gas Mining	0	*	*	*	*	*	*	*	*	*	-	-	0	.10	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.04	.06	.04	.04	.02	.02	.02	.04	*	.01	*	*	.20	*	-	-	.19	.15	-	-	.21	.10	-	-
Electric Utilities	.15	.10	.57	.59	.37	.36	*	.01	*	.02	*	*	.01	.04	.02	.06	.40	.34	-	-	.12	.42	-	-
Industrial Combustion	.11	.13	.18	.23	.07	.15	*	.02	*	.01	-	-	-	-	-	-	.08	.26	-	-	0	.18	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.70	.58	.46	.60	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.09	.22	.02	.03	.43	.38	.68	.56	.95	.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.50	.43	.16	.10	.10	.08	.19	.21	*	.01	.09	.28	.14	.10	*	*	.03	*	-	-	.04	.03	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-6

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 2

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.38	.26	-	-	-	1.54	-
Pulp & Paper	NG	NG	-	-	NG	.25	.25	-	NG	-	1.64	-
Industrial Chemicals	NG	.46	NG	NG	NG	.06	.05	.53	1.41	-	1.28	-
Other Chemical Products	.75	-	NG	1.02	-	.28	.68	0	-	-	2.25	-
Steel	.09	NG	NG	NG	.98	NG	.01	.01	1.65	-	1.51	-
Crushed Stone	.12	-	-	-	-	-	NG	NG	1.72	-	-	-
Non-ferrous Metals	NG	.18	-	-	-	-	*	NG	NG	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	2.66	-
Coal Mining	1.92	NG	NG	NG	NG	-	-	-	-	-	-	-
Crude Petroleum & Nat. Gas Mining	NA	NG	.77	NG	NG	-	NA	-	-	-	-	-
Petroleum Processing	1.17	.93	1.06	1.02	1.30	NG	*	-	1.64	-	1.68	-
Electric Utilities	.47	1.12	1.11	1.65	2.39	NG	2.63	1.98	1.71	-	11.7	-
Industrial Combustion	.82	1.44	2.33	2.51	2.69	-	-	-	6.93	-	NA	-
Municipal	-	-	-	-	-	.29	.41	-	-	-	-	1.98
Transportation	1.67	1.74	1.01	.46	.38	-	-	-	-	-	-	-
Other	.58	.70	.86	.59	.81	1.04	.24	NG	.12	-	2.29	-
Total for Region 2	.68	1.09	1.13	.56	.42	.35	.31	.54	2.02	-	3.45	1.99

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

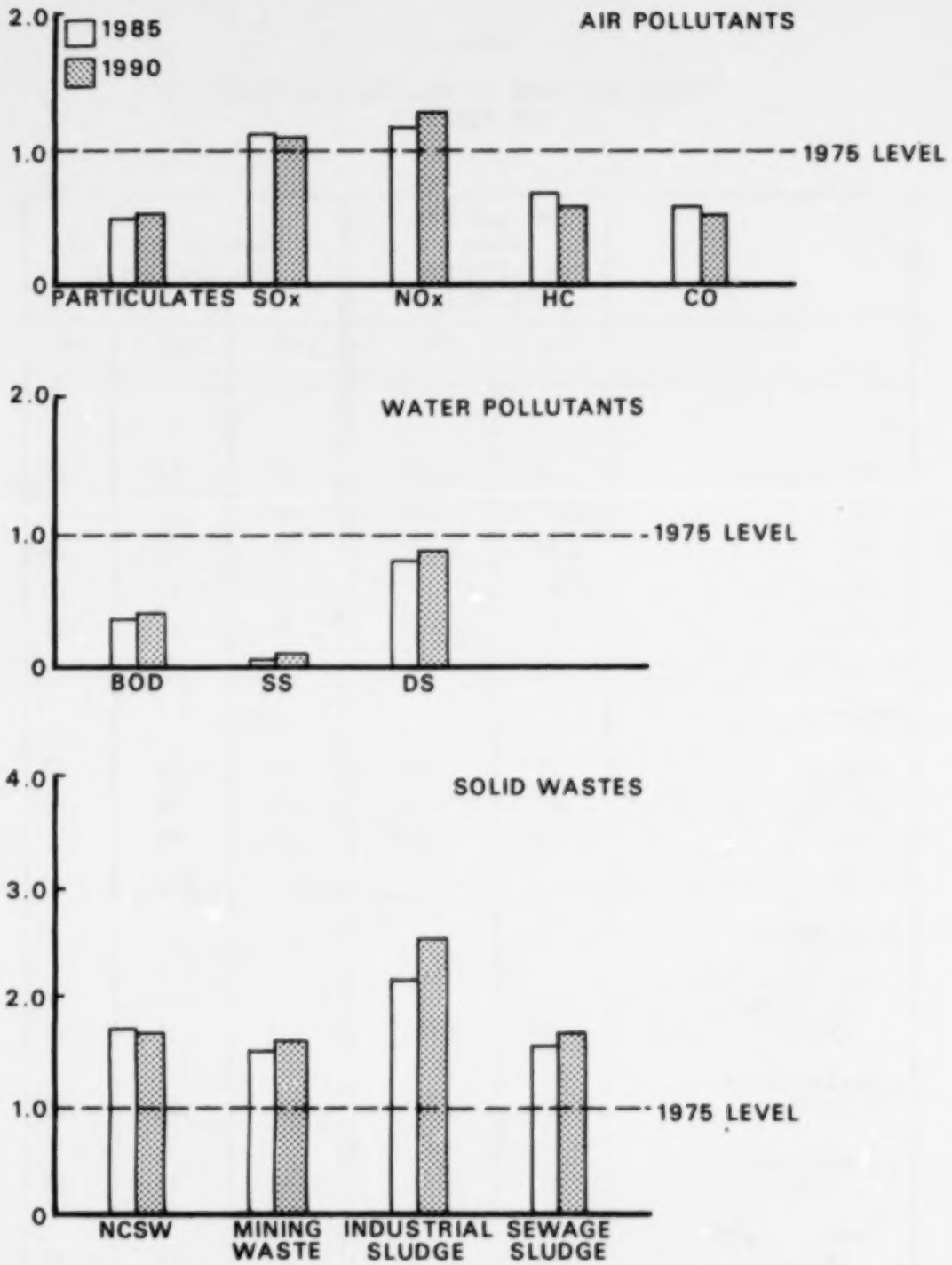


Figure C-3. Region 3 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-7

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 3

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.48	.51	.16	.13	.12
SO_x	1.05	1.04	.16	.15	.15
NO_x	1.17	1.21	.12	.11	.11
HC	.62	.56	.11	.10	.10
CO	.52*	.48*	.11	.11	.11
Water					
BOD	.36*	.39*	.09	.09	.09
SS	.04	.05	.31	.10	.08
DS	.78*	.81*	.21	.23	.21
Solid Waste					
Non-Combustible Solid Waste (NCSW)	1.67	1.67	.12	.11	.11
Mining Waste (M-W)	1.52	1.60	.43	.21	.13
Industrial Sludge (I-S)	2.15	2.55	.15	.13	.13
Sewage Sludge (S-S)	1.58	1.72	.12	.11	.11

*Greater than national pollutant ratio

Table C-8

FRACTION OF REGION 3 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.07	.06	.01	.03	-	-	-	-	-	-	.03	.02	-	-
Pulp & Paper	.01	.01	*	*	-	-	-	-	.01	.02	.12	.06	.01	.05	-	-	.01	.01	-	-	.03	.02	-	-
Industrial Chemicals	*	*	.01	.01	*	*	*	*	*	*	.04	.01	*	*	.30	.08	.02	.02	-	-	.11	.05	-	-
Other Chemical Products	*	*	*	*	*	*	.06	.12	*	*	.13	.10	.01	.08	.03	*	*	*	-	-	.07	.06	-	-
Steel	.18	.03	.02	.01	*	*	.05	.03	.10	.22	*	*	.64	.02	.05	*	.04	.05	-	-	.20	.11	-	-
Crushed Stone	.04	.02	-	-	-	-	-	-	-	-	-	-	*	0	*	0	.23	.24	-	-	.06	.04	-	-
Non-ferrous Metals	*	*	.01	.01	-	-	-	-	-	-	-	-	*	*	*	*	*	*	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	*	0	-	-	-	-	.01	.01	-	-
Coal Mining	.04	.13	*	*	.01	.11	*	.01	*	*	0	*	.24	.05	.56	.84	0	*	1.00	1.00	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	*	*	*	.01	.01	*	*	*	*	-	-	0	.17	-	-	-	-	-	-	-	-	-*	-
Petroleum Processing	.01	.03	.02	.02	.02	.02	.03	.05	*	.01	.01	*	.03	*	-	-	.06	.06	-	-	.14	.09	-	-
Electric Utilities	.21	.16	.67	.61	.42	.42	.01	.02	*	.02	*	*	*	.09	.06	.08	.53	.41	-	-	.34	.39	-	-
Industrial Combustion	.14	.09	.21	.29	.13	.20	.01	.03	*	.01	-	-	-	-	-	-	.10	.21	-	-	0	.20	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.54	.64	.46	.47	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.04	.13	.01	.02	.37	.32	.71	.59	.87	.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.33	.39	.04	.03	.05	.03	.13	.14	*	*	.10	.13	.04	.12	*	*	.01	*	-	-	.02	.02	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-9

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 3

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.34	.25	-	-	-	1.55	-
Pulp & Paper	.52	NG	-	-	1.39	.21	.21	-	1.47	-	1.63	-
Industrial Chemicals	NG	.79	NG	NG	NG	.08	NG	.22	1.57	-	1.19	-
Other Chemical Products	NG	NG	NG	1.08	NG	.28	.58	*	NG	-	2.19	-
Steel	.10	.40	NG	.32	1.01	NG	*	.01	1.80	-	1.38	-
Crushed Stone	.24	-	-	-	-	-	NG	NG	1.74	-	1.53	-
Non-ferrous Metals	NG	.87	-	-	-	-	NG	NG	NG	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	NG	-	-	2.97	-
Coal Mining	1.63	NG	1.63	1.59	NG	NA	.01	1.21	NA	1.60	-	-
Crude Petroleum & Nat. Gas Mining	NG	NG	1.05	1.05	NG	-	NA	-	-	-	-	-
Petroleum Processing	1.20	1.01	1.15	1.06	1.33	.29	*	-	1.66	-	1.68	-
Electric Utilities	.38	.95	1.21	1.53	2.61	NG	1.49	1.12	1.30	-	2.94	-
Industrial Combustion	.32	1.44	1.90	2.03	2.07	-	-	-	3.46	-	NA	-
Municipal	-	-	-	-	-	.46	.47	-	-	-	-	1.72
Transportation	1.75	1.88	1.03	.46	.39	-	-	-	-	-	-	-
Other	.06	.66	.82	.62	NG	.51	.12	.15	.21	-	2.23	-
Total for Region 3	.51	1.04	1.21	.56	.48	.39	.05	.81	1.67	1.60	2.55	1.72

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

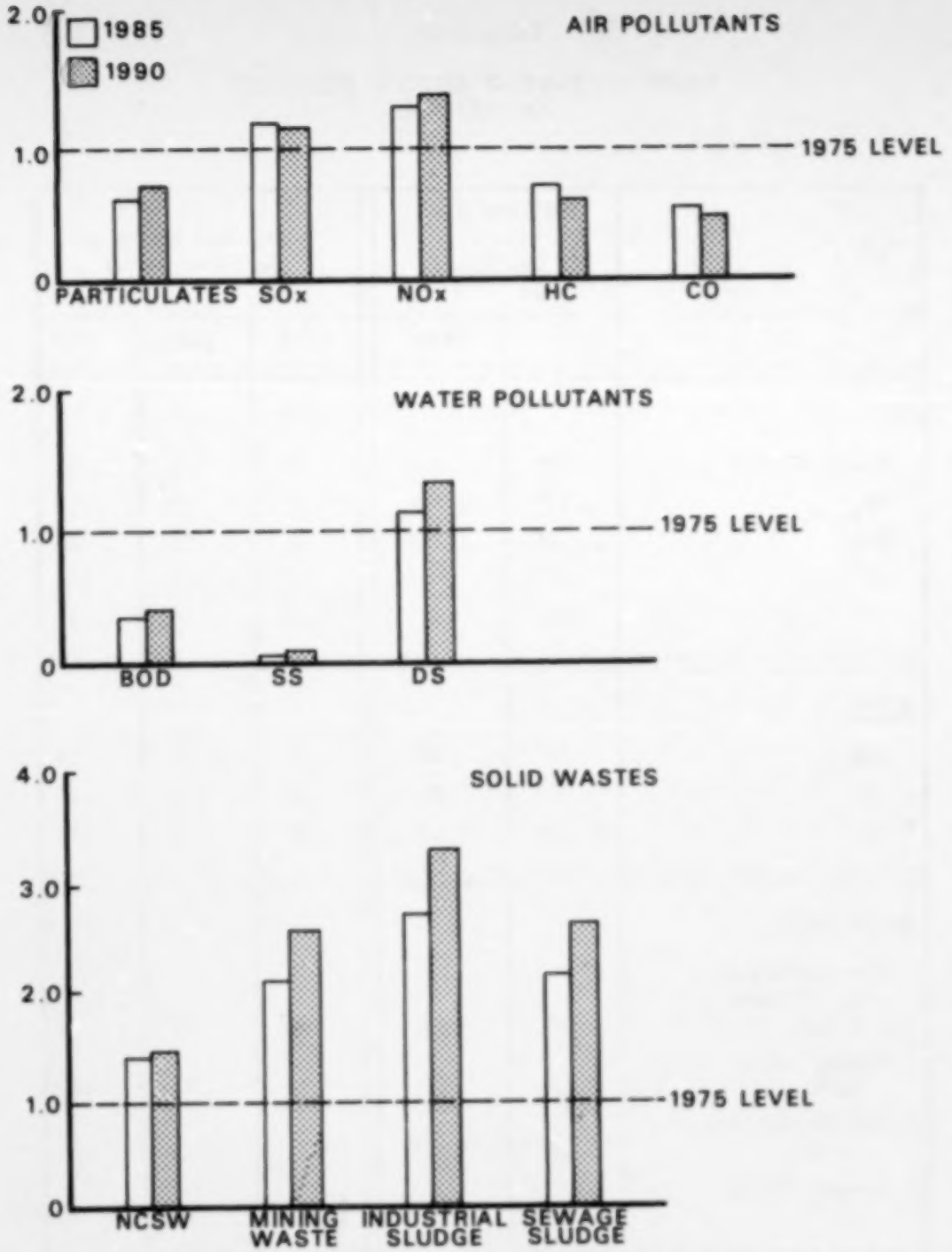


Figure C-4. Region 4 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-10

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 4

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.60	.67*	.21	.21	.21
SO_x	1.17*	1.16*	.19	.20	.20
NO_x	1.27*	1.32*	.16	.16	.16
HC	.64*	.58*	.15	.15	.15
CO	.51	.47	.16	.16	.16
Water					
BOD	.36*	.40*	.17	.17	.18
SS	.08	.10	.20	.18	.16
DS	1.10*	1.30*	.07	.11	.12
Solid Waste					
Non-Combustible Solid Waste (NCSW)	1.40	1.45	.27	.23	.22
Mining Waste (M-W)	2.12	2.61	.18	.12	.09
Industrial Sludge (I-S)	2.74*	3.27*	.21	.23	.23
Sewage Sludge (S-S)	2.18*	2.64*	.11	.13	.14

*Greater than national pollutant ratio

Table C-11

FRACTION OF REGION 4 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.05	.06	.01	.03	-	-	-	-	-	-	.03	.02	-	-
Pulp & Paper	.04	.03	.01	.01	-	-	-	-	.04	.12	.37	.20	.10	.19	-	-	.04	.04	-	-	.13	.06	-	-
Industrial Chemicals	.01	.01	.03	.02	*	*	*	*	*	*	.06	.01	*	*	.49	.56	.35	.36	-	-	.16	.08	-	-
Other Chemical Products	*	*	*	*	*	*	.06	.13	*	*	.11*	.03	.01	.02	.01	*	.01	.01	-	-	.05	.04	-	-
Steel	.02	.01	*	*	*	*	*	*	.02	.03	*	*	.32	*	.04	*	.01	.01	-	-	.03	.02	-	-
Crushed Stone	.02	.01	-	-	-	-	-	-	-	-	-	-	*	0	.01	0	.08	.14	-	-	.02	.01	-	-
Non-ferrous Metals	.01	.02	.01	.01	-	-	-	-	-	-	-	-	.05	*	.01	*	.02	.03	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	*	*	-	-
Coal Mining	.03	.08	*	*	.01	.01	*	.01	*	*	0	*	.26	.01	.17	.19	0	.01	1.00	1.00	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	*	.01	.01	.01	.01	*	*	*	*	-	-	0	.24	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.02	.04	.01	.01	.01	.01	.01	.01	*	.01	*	*	.12	*	-	-	.05	.07	-	-	.22	.14	-	-
Electric Utilities	.30	.12	.76	.68	.43	.46	.01	.02	*	.03	*	*	.01	.08	.25	.25	.41	.24	-	-	.33	.45	-	-
Industrial Combustion	.07	.06	.14	.22	.08	.15	.01	.02	*	.01	-	-	-	-	-	-	.02	.09	-	-	-	-	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.24	.46	.07	.35	-	-	-	-	-	-	0	.14	1.00	1.00
Transportation	.04	.12	.01	.02	.43	.34	.78	.65	.93	.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.44	.50	.03	.02	.03	.02	.12	.15	*	*	.16	.24	.07	.08	*	*	*	*	-	-	.04	.05	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-12

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 4

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.44	.36	-	-	-	1.74	-
Pulp & Paper	.52	1.43	-	-	1.42	.22	.26	-	1.50	-	1.58	-
Industrial Chemicals	1.36	.87	NG	NG	NG	.04	NG	1.46	1.46	-	1.78	-
Other Chemical Products	NG	NG	NG	1.23	NG	.10	.45	*	1.56	-	2.51	-
Steel	.16	NG	NG	NG	1.07	NG	*	.01	1.96	-	1.92	-
Crushed Stone	.25	-	-	-	-	-	NG	0	2.37	-	1.88	-
Non-ferrous Metals	1.91	1.30	-	-	-	-	*	.01	2.26	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	NG	-
Coal Mining	1.97	NG	2.37	2.34	NG	NA	*	1.45	NA	2.61	-	-
Crude Petroleum & Nat. Gas Mining	NG	.98	1.08	NG	NG	-	NA	-	-	-	-	-
Petroleum Processing	1.53	.93	1.06	.91	1.92	NG	*	-	1.94	-	2.10	-
Electric Utilities	2.64	1.05	1.41	1.82	3.30	NG	1.70	1.27	.86	-	4.43	-
Industrial Combustion	.61	1.88	2.37	2.59	2.65	-	-	-	5.82	-	NA	-
Municipal	-	-	-	-	-	.77	.74	-	-	-	-	2.64
Transportation	1.78	1.96	1.06	.47	.39	-	-	-	-	-	-	-
Other	.76	.67	.89	.68	NG	.59	.17	NG	NG	-	3.46	-
Total for Region 4	.67	1.16	1.32	.58	.47	.40	.10	1.30	1.45	2.61	3.27	2.64

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

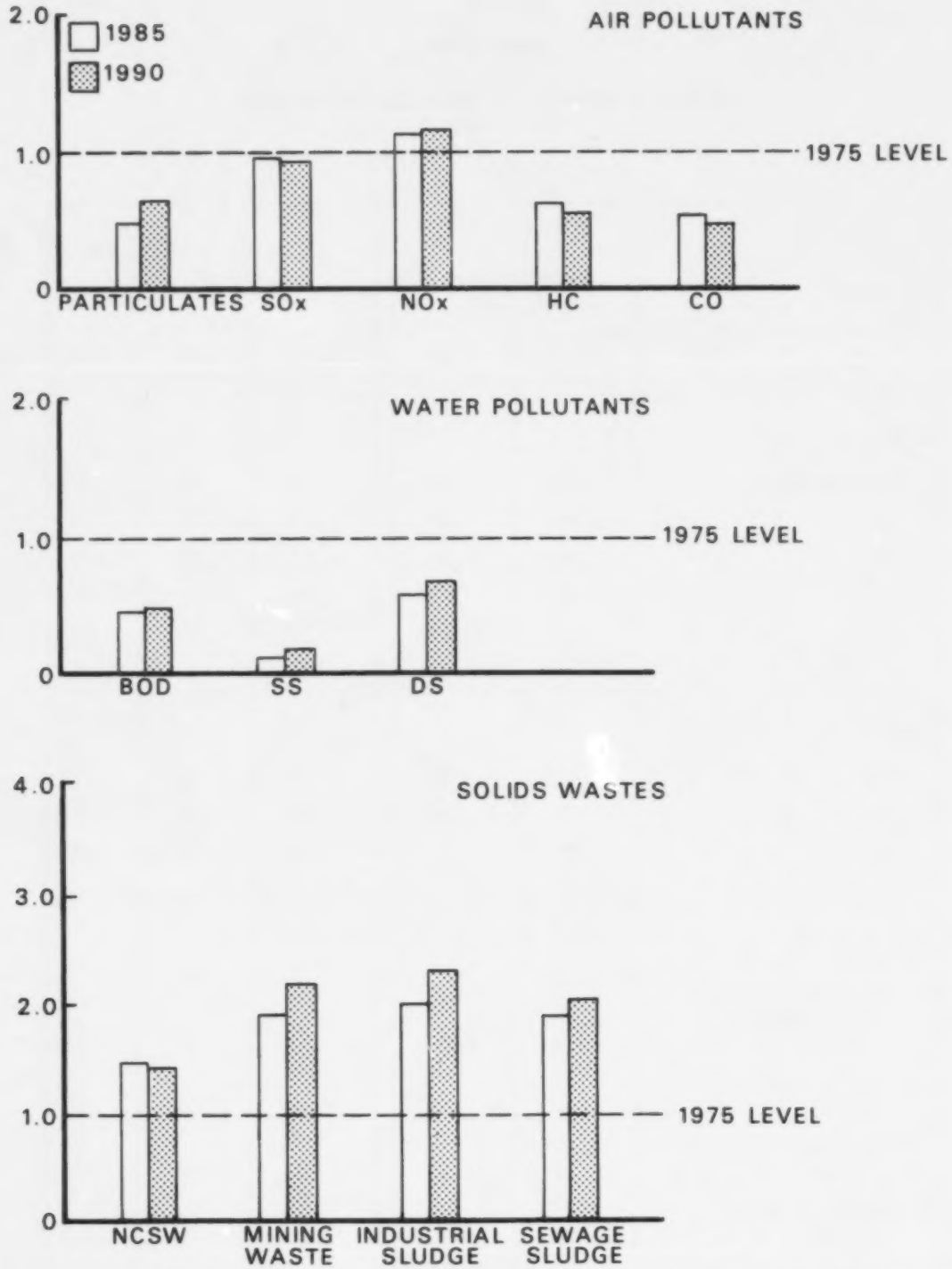


Figure C-5. Region 5 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-13

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 5

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.49	.51	.28	.23	.22
SO_x	1.00	.98	.33	.30	.30
NO_x	1.15	1.17	.22	.20	.20
HC	.62	.55	.20	.19	.19
CO	.52*	.49*	.21	.22	.22
Water					
BOD	.43*	.46*	.16	.19	.19
SS	.11	.18*	.22	.20	.22
DS	.57	.64	.34	.27	.27
Solid Waste					
Non-Combustible Solid Waste (NCSW)	1.45	1.43	.24	.20	.19
Mining Waste (M-W)	1.91	2.16	.08	.05	.03
Industrial Sludge (I-S)	2.00	2.31	.30	.24	.23
Sewage Sludge (S-S)	1.72	1.80	.27	.26	.25

*Greater than national pollutant ratio

Table C-14

FRACTION OF REGION 5 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES+

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.11	.06	.02	.02	-	-	-	-	-	-	.04	.03	-	-
Pulp & Paper	*	*	*	*	-	-	-	-	*	.01	.21	.09	.03	.05	-	-	*	*	-	-	.02	.01	-	-
Industrial Chemicals	*	*	*	*	*	*	*	*	*	*	.05	.01	.01	*	.78	.71	.04	.04	-	-	.10	.03	-	-
Other Chemical Products	*	.01	*	*	*	*	.07	.13	*	*	.06	.04	.01	*	.01	0	*	*	-	-	.02	.02	-	-
Steel	.14	.03	*	*	*	*	.02	.01	.11	.25	*	*	.11	.01	.03	*	.04	.05	-	-	.16	.11	-	-
Crushed Stone	.02	.01	-	-	-	-	-	-	-	-	-	-	*	0	*	0	.13	.15	-	-	.07	.04	-	-
Non-ferrous Metals	*	*	.01	*	-	-	-	-	-	-	-	-	*	*	*	*	*	*	-	-	.01	.01	-	-
Fabrication & Basic Products	-	-	-	-	-	-	.01	*	-	-	-	-	-	-	.01	0	-	-	-	-	-	-	-	-
Coal Mining	.03	.11	*	*	.01	.01	*	.01	*	*	0	*	.55	.01	.09	.17	0	*	1.00	1.00	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	*	*	*	.01	.01	*	*	*	*	-	-	0	.46	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.02	.05	.03	.03	.03	.03	.03	.06	*	.01	.01	.01	.11	*	-	-	.07	.08	-	-	.16	.12	-	-
Electric Utilities	.29	.18	.72	.65	.39	.40	.01	.02	*	.02	*	*	.01	.06	.08	.12	.61	.50	-	-	.42	.45	-	-
Industrial Combustion	.14	.12	.19	.27	.12	.18	.01	.03	*	.01	-	-	-	-	-	-	.16	.16	-	-	0	.17	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.44	.55	.09	.31	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.04	.13	.01	.02	.38	.33	.72	.60	.87	.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.31	.35	.04	.02	.06	.04	.14	.15	*	.01	.12	.25	.04	.04	*	*	.03	.01	-	-	.01	.01	-	-

+Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-15

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 5

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.25	.21	-	-	-	1.58	-
Pulp & Paper	NG	NG	-	-	1.28	.19	.25	-	NG	-	1.70	-
Industrial Chemicals	1.15	NG	NG	NG	NG	.05	.03	.59	1.44	-	.65	-
Other Chemical Products	.73	NG	NG	1.13	NG	.29	.62	0	NG	-	1.65	-
Steel	.13	NG	NG	.26	1.07	NG	.01	.01	1.88	-	1.58	-
Crushed Stone	.27	-	-	-	-	-	NG	NG	1.75	-	1.42	-
Non-ferrous Metals	NG	NG	-	-	-	-	NG	NG	NG	-	-	-
Fabrication & Basic Products	-	-	-	.10	-	-	-	0	-	-	2.76	-
Coal Mining	1.75	NG	1.67	1.66	NG	NA	*	1.24	NA	2.16	-	-
Crude Petroleum & Nat. Gas Mining	NG	NG	1.00	NG	NG	-	NA	-	-	-	-	-
Petroleum Processing	1.22	1.00	1.14	1.05	1.31	.29	*	-	1.61	-	1.76	-
Electric Utilities	.32	.90	1.20	1.39	2.23	NG	1.28	.95	1.18	-	2.48	-
Industrial Combustion	.43	1.43	1.71	1.83	1.79	-	-	-	.27	-	NA	-
Municipal	-	-	-	-	-	.58	.61	-	-	-	-	1.80
Transportation	1.70	1.84	1.03	.46	.39	-	-	-	-	-	-	-
Other	.57	.43	.82	.59	.63	.99	.18	NG	.50	-	1.88	-
Total for Region 5	.51	.98	1.17	.55	.49	.46	.18	.64	1.43	2.16	2.31	1.80

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

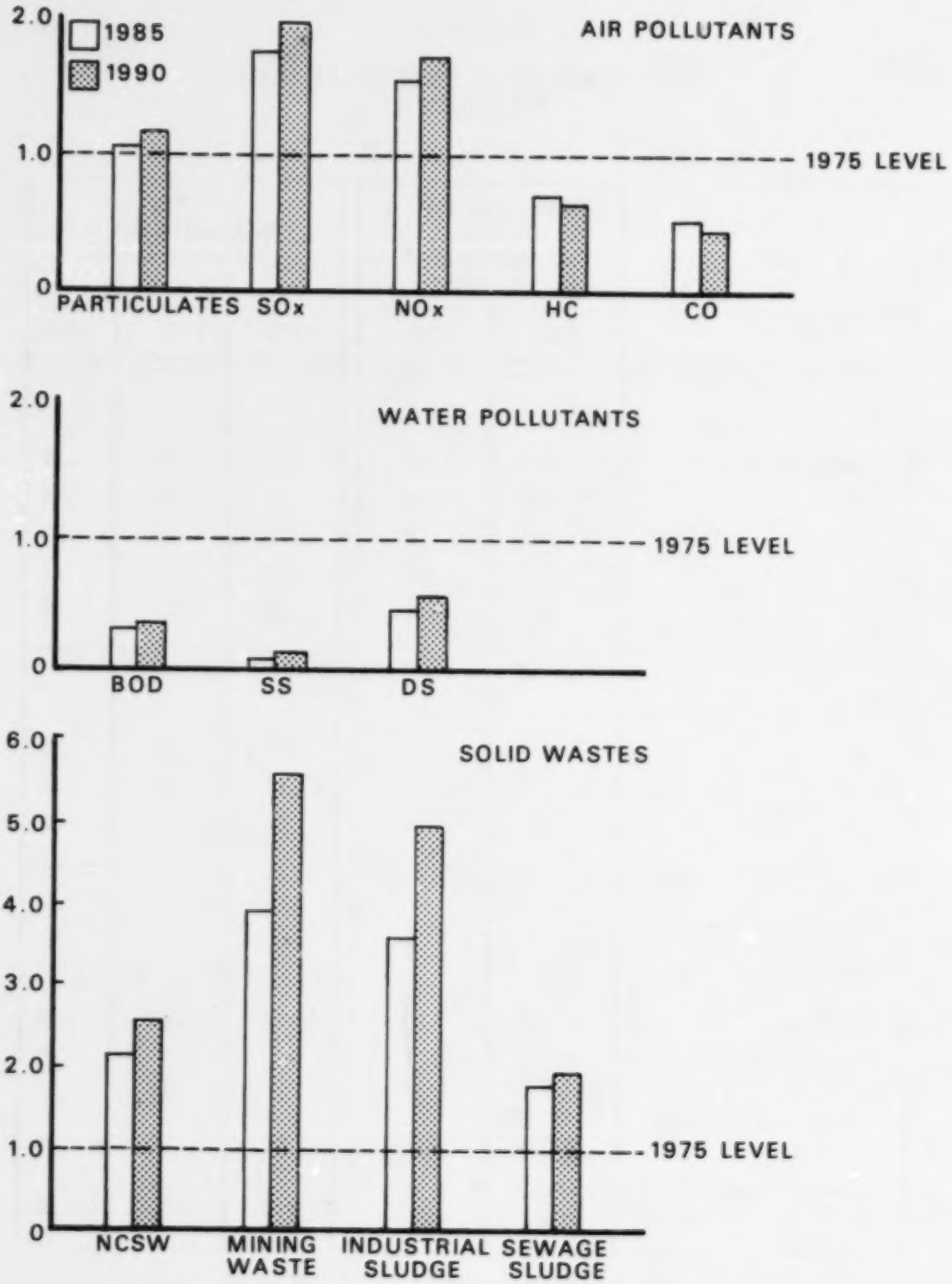


Figure C-6. Region 6 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-16

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 6

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	1.02*	1.18*	.09	.15	.15
SO_x	1.77*	1.98*	.06	.09	.11
NO_x	1.55*	1.71*	.11	.14	.14
HC	.69*	.63*	.12	.14	.14
CO	.52*	.48*	.12	.12	.12
Water					
BOD	.34	.37*	.10	.09	.09
SS	.10	.14	.12	.10	.10
DS	.44	.57	.08	.05	.05
Solid Waste					
Non-Combustible Solid Waste (NCSW)	2.10*	2.56*	.17	.21	.24
Mining Waste (M-W)	3.82*	5.52*	.15	.19	.15
Industrial Sludge (I-S)	3.58*	4.89*	.09	.13	.15
Sewage Sludge (S-S)	1.78	1.88	.10	.10	.10

*Greater than national pollutant ratio

Table C-17

FRACTION OF REGION 6 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.07	.06	.01	.02	-	-	-	-	-	-	.04	.01	-	-
Pulp & Paper	.04	*	.01	.01	-	-	-	-	.02	.05	.24	.14	.06	.10	-	-	.02	.01	-	-	.10	.03	-	-
Industrial Chemicals	.01	.01	.07	.04	*	*	.01	.03	*	*	.14	.02	.01	.01	.76	.65	.21	.14	-	-	.25	.09	-	-
Other Chemical Products	.01	*	.01	.01	*	*	.05	.10	.01	.03	.15	.12	.02	.09	.14	0	.01	.01	-	-	.11	.06	-	-
Steel	.01	*	*	*	*	*	*	*	*	.01	*	*	.02	*	.01	*	*	*	-	-	.01	.01	-	-
Crushed Stone	.07	.02	-	-	-	-	-	-	-	-	-	-	*	0	.01	0	.16	.15	-	-	.10	.04	-	-
Non-ferrous Metals	.11	.22	.32	.06	-	-	-	-	-	-	-	-	.60	*	.05	*	.27	.30	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	.01	*	-	-
Coal Mining	.02	.04	*	*	*	.01	*	*	*	*	0	.01	.01	*	*	*	0	.01	.02	.04	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	.01	*	*	.10	.05	.01	.01	*	.01	-	-	0	.33	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.08	.07	.38	.18	.12	.08	.10	.17	.01	.01	.03	.02	.14	.01	-	-	.28	.10	-	-	.35	.12	-	-
Electric Utilities	.04	.07	.07	.44	.12	.30	*	.01	*	.02	*	*	*	.08	.02	.34	.03	.16	-	-	.02	.39	-	-
Industrial Combustion	.03	.07	.05	.21	.14	.25	*	.03	*	.02	-	-	-	-	-	-	*	.11	-	-	0	.23	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.29	.52	.08	.34	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.08	.11	.03	.03	.47	.30	.74	.55	.95	.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.51	.35	.05	.01	.03	.02	.09	.09	*	*	.09	.12	.04	.02	*	*	*	.01	.97	.96	.01	.01	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-18

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 6

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.32	.21	-	-	-	1.60	-
Pulp & Paper	.52	1.41	-	-	1.41	.21	.23	-	1.49	-	1.57	-
Industrial Chemicals	1.66	1.08	NG	1.92	2.06	.06	.10	.48	1.70	-	1.83	-
Other Chemical Products	.99	1.95	NG	1.25	1.95	.29	.71	0	1.82	-	2.54	-
Steel	.24	NG	NG	NG	1.21	NG	*	.01	NG	-	2.78	-
Crushed Stone	.41	-	-	-	-	-	NG	0	2.39	-	1.90	-
Non-ferrous Metals	2.36	.35	-	-	-	-	*	.01	2.84	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	3.10	-
Coal Mining	2.43	NG	7.18	NG	NG	NA	*	NG	NA	7.97	-	-
Crude Petroleum & Nat. Gas Mining	2.00	NG	.85	.85	.82	-	NA	-	-	-	-	-
Petroleum Processing	1.05	.92	1.05	1.07	.90	.29	.01	-	.93	-	1.70	-
Electric Utilities	2.26	12.14	4.14	12.01	12.03	NG	14.09	10.22	12.77	-	92.65	-
Industrial Combustion	3.06	8.16	3.07	5.85	3.84	-	-	-	956.56	-	NA	-
Municipal	-	-	-	-	-	.67	.61	-	-	-	-	1.95
Transportation	1.66	1.88	1.07	.47	.42	-	-	-	-	-	-	-
Other	.81	.63	.80	.62	NG	.50	.09	NG	1.10	5.46	3.20	-
Total for Region 6	1.18	1.98	1.71	.63	.48	.37	.14	.57	2.56	5.52	4.89	1.88

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

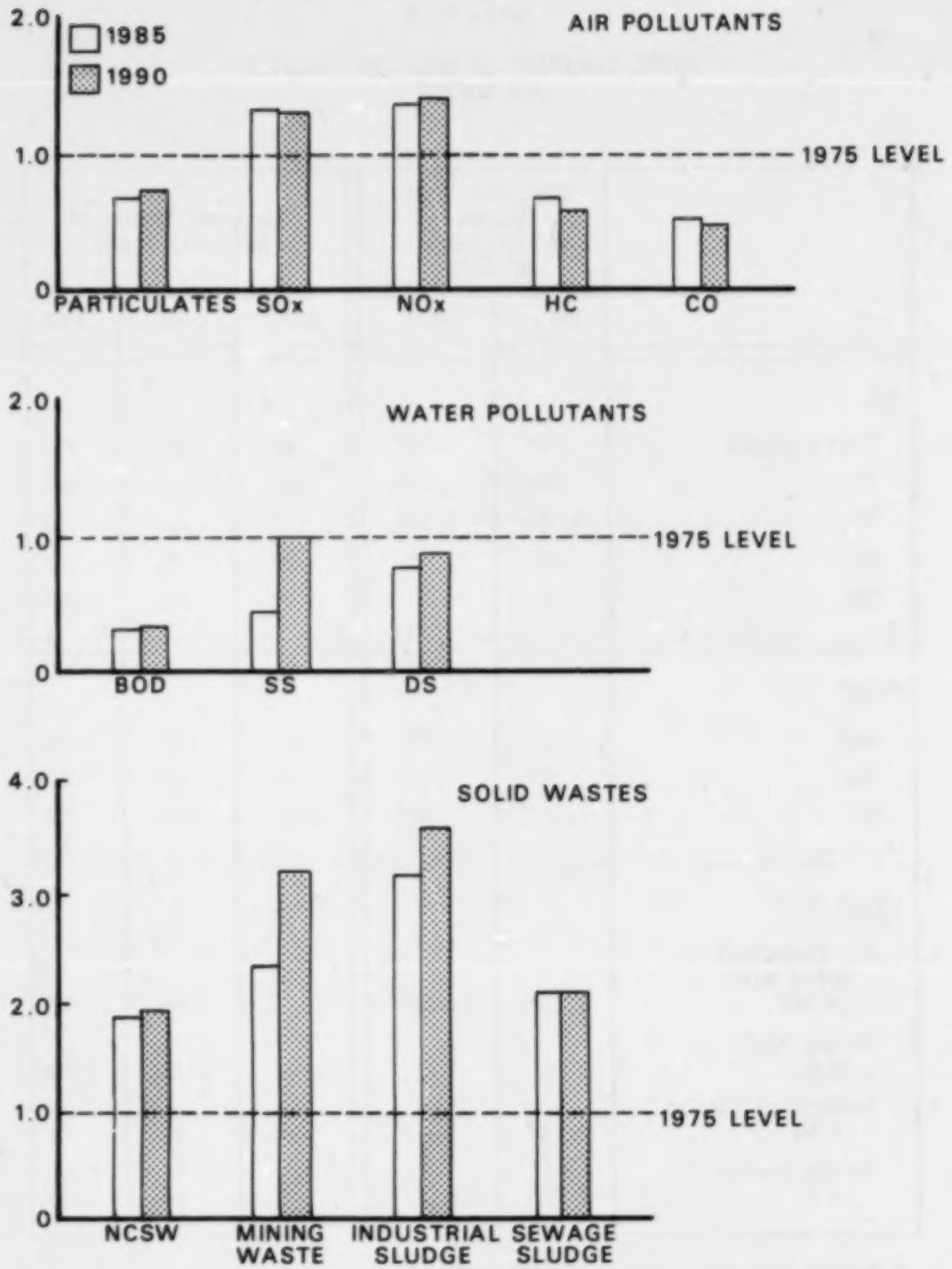


Figure C-7. Region 7 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-19

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 7

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.66*	.72*	.06	.07	.07
SO_x	1.30*	1.30*	.06	.07	.07
NO_x	1.33*	1.36*	.05	.05	.05
HC	.61	.54	.05	.05	.05
CO	.45	.40	.05	.05	.05
Water					
BOD	.34	.34*	.05	.05	.05
SS	.41*	.99*	.02	.08	.12
DS	.75*	.85*	.02	.02	.02
Solid Waste					
Non-Combustible Solid Waste (NCSW)	1.89*	1.95*	.05	.06	.05
Mining Waste (M-W)	2.31	3.18	<.01	<.01	<.01
Industrial Sludge (I-S)	3.14*	3.56*	.06	.08	.08
Sewage Sludge (S-S)	2.08*	2.07*	.05	.06	.05

*Greater than national pollutant ratio

Table C-20

FRACTION OF REGION 7 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.22	.07	.11	.01	-	-	-	-	-	-	.15	.07	-	-
Pulp & Paper	*	*	*	*	-	-	-	-	-	-	.01	.01	.01	*	-	-	*	*	-	-	*	*	-	-
Industrial Chemicals	*	*	.01	.01	*	*	*	*	*	*	.02	*	.01	*	.48	.48	.10	.07	-	-	.25	.14	-	-
Other Chemical Products	*	*	*	*	.01	.01	.06	.13	*	*	.01	.01	.01	*	.23	0	.01	.01	-	-	.06	.03	-	-
Steel	*	*	*	*	*	*	*	*	*	*	*	*	.01	*	.02	*	*	*	-	-	.01	.01	-	-
Crushed Stone	.07	.02	-	-	-	-	-	-	-	-	-	-	.01	0	.03	0	.38	.38	-	-	.03	.01	-	-
Non-ferrous Metals	*	*	.05	.01	-	-	-	-	-	-	-	-	*	*	*	*	*	*	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	*	*	-	-
Coal Mining	.04	.13	*	*	.01	.01	*	.01	*	*	0	*	.00	*	.06	.14	0	*	1.00	1.00	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	.01	*	*	.02	.01	*	*	*	*	-	-	0	.75	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.02	.03	.03	.02	.02	.02	.02	.03	*	.01	*	*	.23	*	-	-	.08	.05	-	-	.15	.07	-	-
Electric Utilities	.14	.11	.75	.76	.27	.41	*	.02	*	.02	*	*	.01	.03	.17	.38	.31	.37	-	-	.35	.57	-	-
Industrial Combustion	.06	.05	.10	.14	.08	.11	*	.01	*	.01	-	-	-	-	-	-	.03	.08	-	-	0	.10	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.64	.75	.40	.18	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.05	.12	.01	.02	.52	.39	.78	.66	.99	.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.61	.53	.04	.03	.07	.05	.12	.13	*	.01	.10	.15	.13	.01	*	*	.09	.05	-	-	*	*	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-21

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 7

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	1.20	.13	-	-	-	1.53	-
Pulp & Paper	NG	NG	-	-	-	.27	.26	-	NG	-	NG	-
Industrial Chemicals	NG	.81	NG	NG	NG	.07	.24	.87	1.39	-	2.03	-
Other Chemical Products	NG	NG	1.21	1.13	NG	.27	.58	0	1.54	-	1.98	-
Steel	NG	NG	NG	NG	NG	NG	.01	*	NG	-	2.53	-
Crushed Stone	.17	-	-	-	-	-	0	0	1.96	-	1.55	-
Non-ferrous Metals	NG	.35	-	-	-	-	NG	NG	NG	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	NG	-
Coal Mining	2.12	NG	2.22	2.23	NG	NA	.04	1.94	NA	-	-	-
Crude Petroleum & Nat. Gas Mining	19.90	NG	.78	NG	NG	-	NA	-	-	3.18	-	-
Petroleum Processing	1.10	.79	.90	.99	1.22	NG	*	-	1.19	-	1.63	-
Electric Utilities	.56	1.31	2.09	2.71	4.23	NG	2.54	1.88	2.35	-	5.82	-
Industrial Combustion	.60	1.87	1.81	2.16	2.03	-	-	-	4.78	-	NA	-
Municipal	-	-	-	-	-	.40	.46	-	-	-	-	2.07
Transportation	1.66	1.85	1.01	.45	.38	-	-	-	-	-	-	-
Other	.63	.86	.80	.58	.96	.51	.09	NG	.97	-	NG	-
Total for Region 7	.72	1.30	1.36	.54	.40	.34	.99	.85	1.95	3.18	3.56	2.07

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

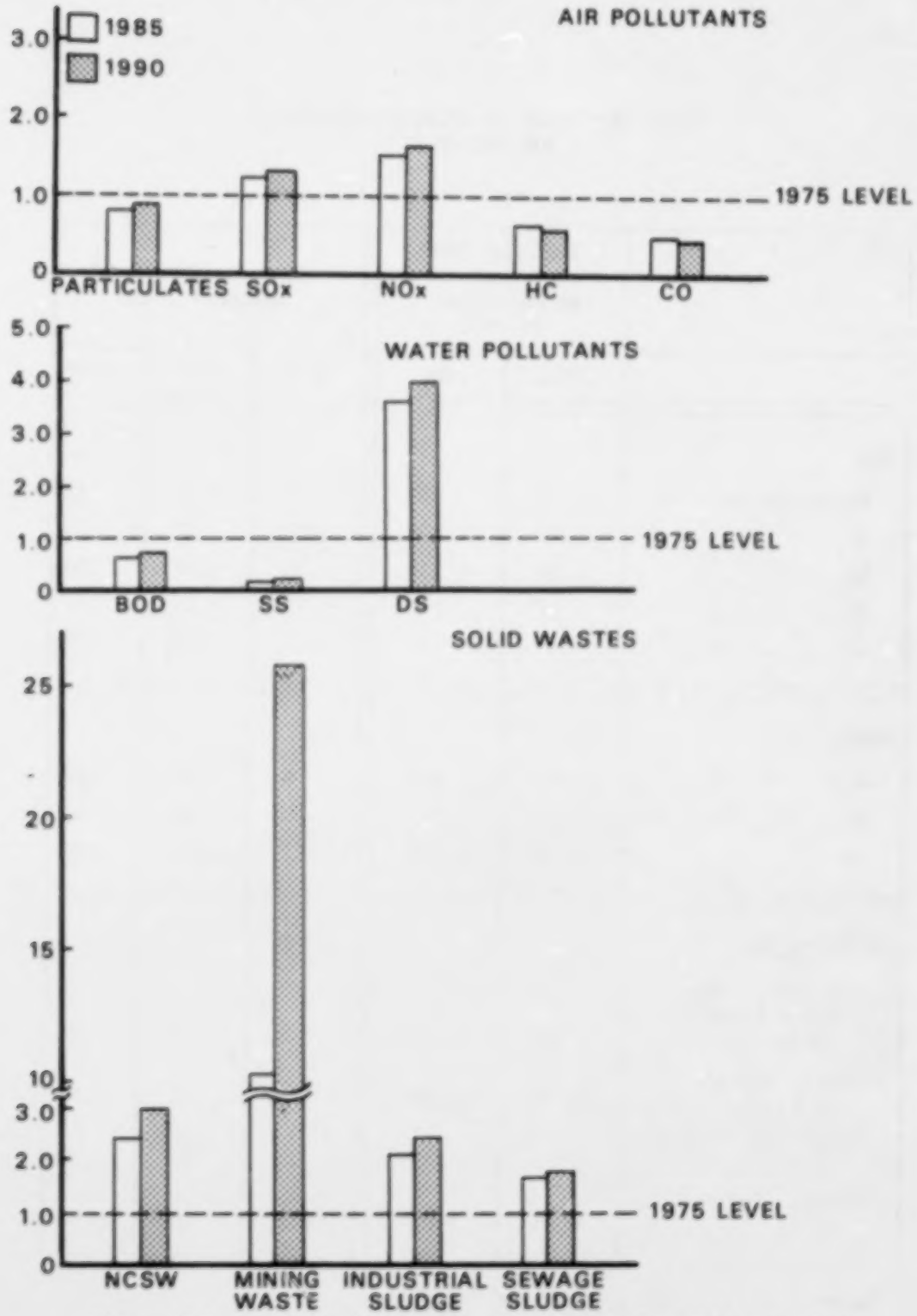


Figure C-8. Region 8 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-22

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 8

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.72*	.84*	.03	.03	.03
SO_x	1.23*	1.31*	.02	.02	.03
NO_x	1.45*	1.64*	.03	.03	.04
HC	.65*	.60*	.03	.03	.03
CO	.50	.46	.03	.03	.03
Water					
BOD	.57*	.62*	.02	.04	.04
SS	.14*	.14	.03	.04	.03
DS	3.50*	3.88*	.01	.06	.06
Solid Waste					
Non-Combustible Solid Waste (NCSW)	2.46*	2.96*	.03	.05	.05
Mining Waste (M-W)	10.14*	25.70*	.13	.41	.59
Industrial Sludge (I-S)	2.01	2.37	.02	.02	.02
Sewage Sludge (S-S)	1.58	1.62	.04	.03	.03

*Greater than national pollutant ratio

Table C-23

FRACTION OF REGION 8 POLLUTANT DISCHARGE+
CONTRIBUTED BY SELECTED SOURCE CATEGORIES

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.22	.02	.64	.02	-	-	-	-	-	-	.13	.10	-	-
Pulp & Paper	.01	.01	*	*	-	-	-	-	.01	.01	.04	.02	.01	.02	-	-	.01	*	-	-	.03	.02	-	-
Industrial Chemicals	*	*	.01	.01	*	*	*	*	*	*	*	*	*	*	.01	*	.09	.05	-	-	.03	.02	-	-
Other Chemical Products	*	*	-	-	*	*	.05	.10	-	-	*	*	*	*	.21	0	*	*	-	-	.01	.01	-	-
Steel	.10	.01	*	*	*	*	*	*	.02	.04	*	*	.27	.01	.05	*	.01	.01	-	-	.13	.06	-	-
Crushed Stone	.05	.02	-	-	-	-	-	-	-	-	-	-	*	0	.01	0	.19	.14	-	-	.07	.06	-	-
Non-ferrous Metals	*	*	.40	.10	-	-	-	-	-	-	-	-	*	*	*	*	.01	*	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	*	*	-	-
Coal Mining	.07	.24	*	.04	.01	.10	*	.02	*	.01	0	.12	.35	.29	.53	.94	0	.39	.11	.04	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	.02	*	*	.02	.01	*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.04	.12	.10	.14	.05	.08	.03	.09	.01	.01	.01	.01	.13	*	-	-	.19	.06	0	.77	.42	.27	-	-
Electric Utilities	.29	.13	.28	.33	.28	.24	*	.01	*	.02	0	*	.01	.06	.18	.05	.42	.17	-	-	.17	.20	-	-
Industrial Combustion	.09	.09	.09	.33	.08	.20	*	.03	*	.02	-	-	-	-	-	-	.04	.15	-	-	0	.27	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.58	.70	.12	.56	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.07	.14	.02	.03	.51	.33	.80	.65	.96	.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.27	.23	.08	.03	.06	.03	.10	.10	*	*	.14	.13	.05	.04	*	*	.05	.01	.89	.19	*	*	-	-

+Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-24

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 8

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.06	.04	-	-	-	1.71	-
Pulp & Paper	.52	NG	-	-	1.40	.24	.27	-	1.48	-	1.51	-
Industrial Chemicals	NG	.53	NG	NG	NG	NG	NG	.96	1.65	-	1.69	-
Other Chemical Products	NG	-	NG	1.13	-	NG	NG	0	NG	-	1.70	-
Steel	.08	NG	NG	NG	.95	NG	.01	.01	1.78	-	1.06	-
Crushed Stone	.28	-	-	-	-	-	NG	0	2.27	-	1.94	-
Non-ferrous Metals	NG	.34	-	-	-	-	NG	NG	1.14	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	NG	-
Coal Mining	2.71	14.98	22.34	4.61	4.89	NA	.12	6.89	NA	10.39	-	-
Crude Petroleum & Nat. Gas Mining	38.51	.91	1.08	NG	NG	-	-	-	-	-	-	-
Petroleum Processing	2.52	1.82	2.88	1.47	1.07	.31	*	-	1.00	NA	1.50	-
Electric Utilities	.39	1.53	1.40	1.83	3.76	NA	1.57	1.13	1.24	-	2.84	-
Industrial Combustion	.76	4.81	4.41	5.34	5.18	-	-	-	12.52	-	NA	-
Municipal	-	-	-	-	-	.75	.68	-	-	-	-	1.62
Transportation	1.66	1.89	1.08	.49	.42	-	-	-	-	-	-	-
Other	.73	.42	.71	.58	NG	.59	.10	NG	.76	5.37	NG	-
Total for Region 8	.84	1.31	1.64	.60	.46	.62	.14	3.88	2.96	25.70	2.37	1.62

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

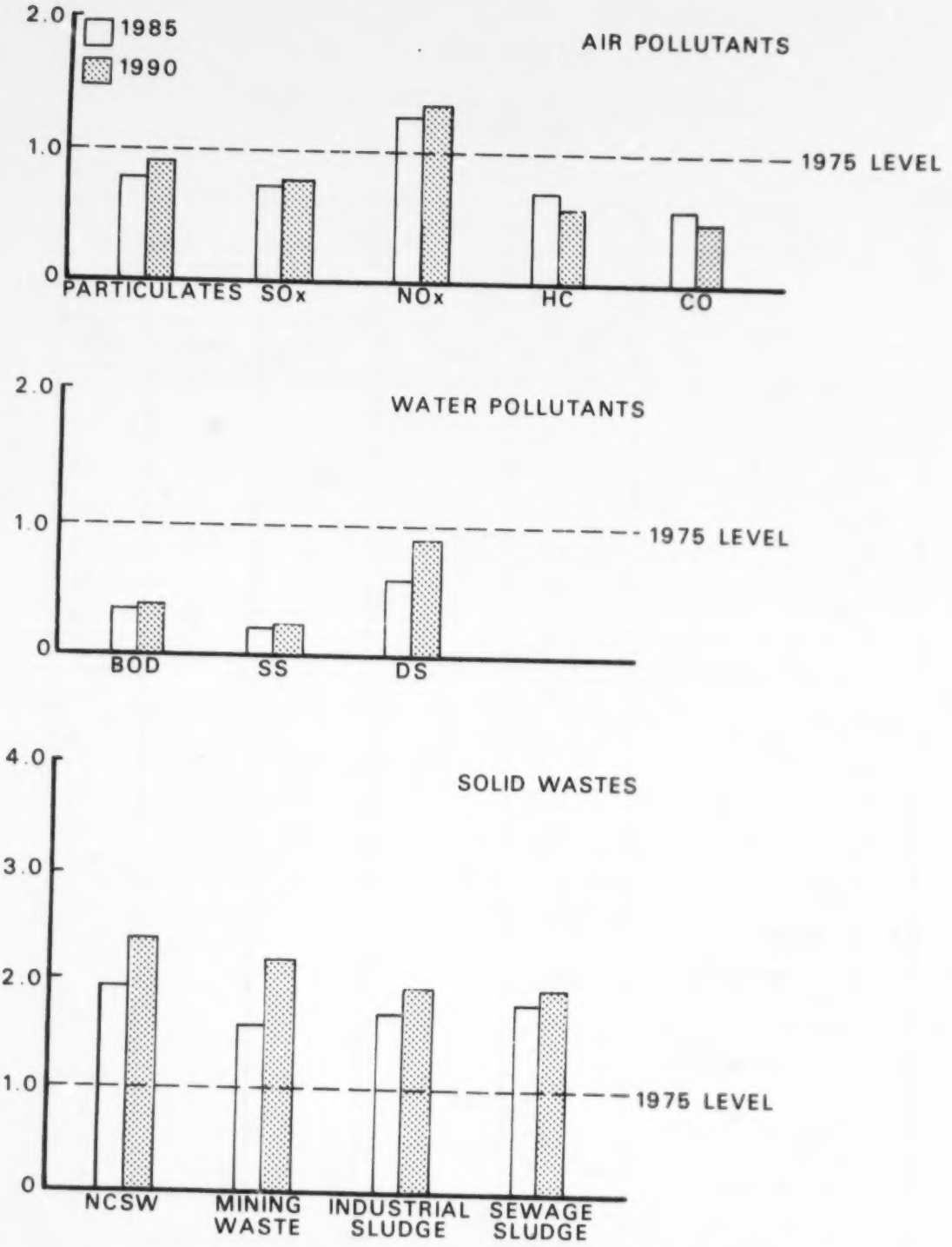


Figure C-9. Region 9 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-25

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 9

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.79*	.86*	.05	.06	.06
SO_x	.70	.72	.07	.05	.05
NO_x	1.20	1.31*	.08	.08	.08
HC	.64*	.57	.12	.12	.12
CO	.51	.47	.12	.13	.13
Water					
BOD	.36*	.38*	.11	.11	.11
SS	.21*	.23*	.04	.08	.06
DS	.55	.84*	.01	.01	.01
Solid Waste					
Non-Combustible Solid Waste (NCSW)	1.97*	2.37*	.05	.06	.07
Mining Waste (M-W)	1.57	2.16	.01	<.01	<.01
Industrial Sludge (I-S)	1.67	1.92	.04	.03	.03
Sewage Sludge (S-S)	1.81	1.88	.13	.13	.13

*Greater than national pollutant ratio

Table C-26

FRACTION OF REGION 9 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.08	.08	.07	.04	-	-	-	-	-	-	.07	.06	-	-
Pulp & Paper	.01	.01	*	*	-	-	-	-	*	.01	.06	.03	.05	.05	-	-	.01	.01	-	-	.04	.03	-	-
Industrial Chemicals	*	*	.02	.01	*	*	*	*	*	*	.01	*	*	*	.48	.31	.13	.08	-	-	.05	.05	-	-
Other Chemical Products	.01	*	*	*	*	*	.06	.11	*	*	.03	.02	.01	.03	.14	0	.01	*	-	-	.06	.06	-	-
Steel	.03	.01	*	*	*	*	*	*	.01	.02	*	*	.02	*	.10	*	.01	*	-	-	.05	.04	-	-
Crushed Stone	.13	.02	-	-	-	-	-	-	-	-	-	-	.01	0	.10	0	.48	.42	-	-	.10	.10	-	-
Non-ferrous Metals	.03	*	.70	.19	-	-	-	-	-	-	-	-	*	*	*	*	.03	.02	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.11	0	-	-	-	-	.02	.02	-	-
Coal Mining	*	.01	*	*	*	*	*	*	*	*	-	-	0	*	0	*	-	-	1.00	1.00	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	*	*	*	.01	.01	*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.07	.09	.09	.10	.05	.04	.03	.06	*	.01	.01	.01	.30	*	-	-	.29	.15	-	-	.59	.49	-	-
Electric Utilities	.03	.07	.06	.25	.14	.19	*	.01	*	.01	*	*	*	.04	.06	.69	.04	.18	-	-	.01	.10	-	-
Industrial Combustion	.04	.11	.07	.34	.07	.15	*	.01	*	*	-	-	-	-	-	-	*	.13	-	-	0	.01	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.73	.66	.43	.74	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.16	.30	.03	.07	.68	.59	.80	.69	.98	.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.49	.38	.03	.03	.05	.03	.11	.12	*	*	.08	.20	.10	.08	.01	*	.01	*	-	-	.02	.03	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-27

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISHCARGES
FROM SELECTED SOURCES IN REGION 9

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.39	.18	-	-	-	1.76	-
Pulp & Paper	.51	1.38	-	-	1.38	.21	.22	-	1.46	-	1.53	-
Industrial Chemicals	NG	.40	NG	NG	NG	.09	.20	.55	1.46	-	1.88	-
Other Chemical Products	.75	NG	NG	1.14	NG	.29	.65	0	1.62	-	2.08	-
Steel	.12	NG	NG	NG	1.15	NG	.03	.01	1.91	-	1.63	-
Crushed Stone	.13	-	-	-	-	-	0	0	2.08	-	1.86	-
Non-ferrous Metals	.12	.19	-	-	-	-	NG	NG	1.49	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	2.25	-
Coal Mining	2.12	NG	NG	NG	NG	-	NA	NA	-	2.16	-	-
Crude Petroleum & Nat. Gas Mining	NG	NG	1.08	NG	NG	-	-	-	-	-	-	-
Petroleum Processing	1.05	.79	.90	.96	1.12	.26	*	-	1.21	-	1.61	-
Electric Utilities	1.65	3.26	1.71	3.50	3.45	NG	13.6	9.76	11.98	-	28.85	-
Industrial Combustion	2.28	3.64	2.95	3.96	NG	-	-	-	72.21	-	NA	-
Municipal	-	-	-	-	-	.34	.39	-	-	-	-	1.88
Transportation	1.67	1.88	1.13	.50	.46	-	-	-	-	-	-	-
Other	.68	.68	.82	.64	NG	.93	.18	.01	NG	-	3.63	-
Total for Region 9	.86	.72	1.31	.57	.47	.38	.23	.84	2.37	2.16	1.92	1.88

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0

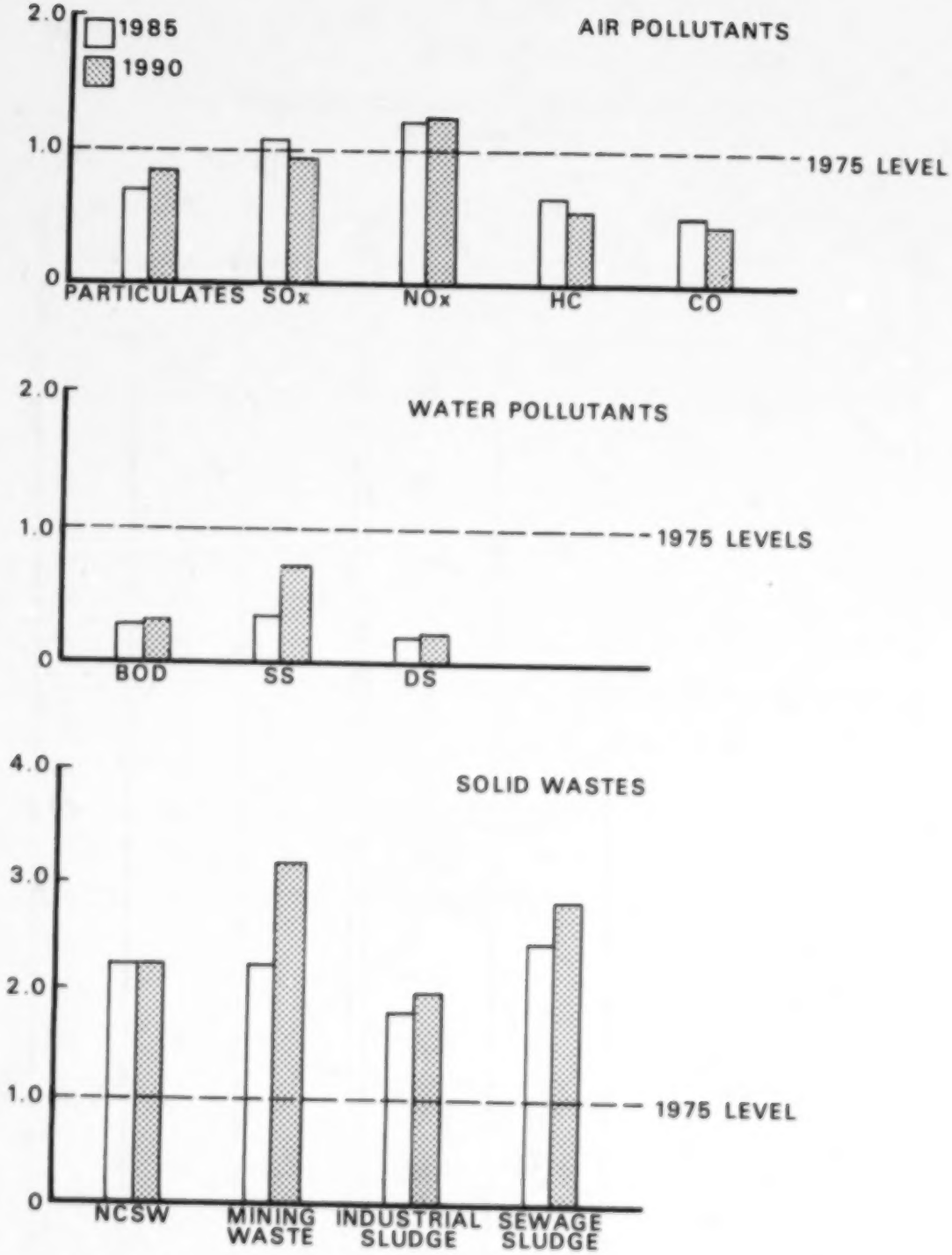


Figure C-10. Region 10 discharges of pollutants in 1985 and 1990 relative to 1975 discharges.

Table C-28

FUTURE DISCHARGE OF SELECTED POLLUTANTS
FOR REGION 10

	1985 and 1990 Values as Multiples of 1975		Regional Share of National Total		
	1985	1990	1975	1985	1990
Air					
Particulates	.74*	.82*	.02	.03	.03
SO_x	1.08	.96	.01	.01	.01
NO_x	1.21	1.22	.02	.02	.02
HC	.65*	.57	.03	.04	.03
CO	.51	.46	.04	.04	.04
Water					
BOD	.25	.28*	.10	.07	.07
SS	.33*	.67*	.02	.07	.09
DS	.17	.19	.01	<.01	<.01
Solid Waste					
Non-Combustible Solid Waste (NCSW)	2.23*	2.25*	.02	.03	.02
Mining Waste (M-W)	2.19	3.20	.01	.01	<.01
Industrial Sludge (I-S)	1.74	1.89	.02	.02	.01
Sewage Sludge (S-S)	2.39*	2.77*	.03	.04	.04

*Greater than national pollutant ratio

Table C-29

FRACTION OF REGION 10 POLLUTANT DISCHARGE CONTRIBUTED BY SELECTED SOURCE CATEGORIES*

	Part.		SO_x		NO_x		HC		CO		BOD		SS		DS		NCSW		M-W		I-S		S-S	
	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90	75	90
Food Processing	-	-	-	-	-	-	-	-	-	-	.06	.09	.09	.03	-	-	-	-	-	-	.06	.06	-	-
Pulp & paper	.09	.07	.04	.06	-	-	-	-	.04	.12	.69	.26	.38	.13	-	-	.13	.08	-	-	.29	.22	-	-
Industrial Chemicals	*	.01	.06	.07	*	*	*	*	*	*	*	*	*	*	.83	.08	.36	.21	-	-	.12	.10	-	-
Other Chemical Products	*	*	-	-	*	*	.05	.10	-	-	.01	.01	.01	.01	.01	0	.01	.01	-	-	.02	.02	-	-
Steel	*	.01	*	*	*	*	*	*	*	*	*	*	*	*	.03	*	.01	.01	-	-	.04	.05	-	-
Crushed Stone	.04	.01	-	-	-	-	-	-	-	-	-	-	*	0	.02	0	.22	.22	-	-	.05	.04	-	-
Non-ferrous Metals	*	*	.41	.12	-	-	-	-	-	-	-	-	*	*	.01	*	.01	.01	-	-	-	-	-	-
Fabrication & Basic Products	-	-	-	-	-	-	*	*	-	-	-	-	-	-	.01	0	-	-	-	-	*	*	-	-
Coal Mining	*	.01	*	*	*	*	*	*	*	*	-	-	.05	*	.09	.79	-	-	.65	.27	-	-	-	-
Crude Petroleum & Nat. Gas Mining	*	.02	*	*	.01	.03	*	*	*	*	-	-	0	.62	-	-	-	-	-	-	-	-	-	-
Petroleum Processing	.04	.06	.15	.17	.05	.07	.03	.10	*	.02	*	*	.20	*	-	-	.20	.35	-	-	.42	.41	-	-
Electric Utilities	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	.12	*	.01	-	-	*	*	-	-
Industrial Combustion	.03	.04	.16	.43	.08	.18	*	.01	*	.01	-	-	-	-	-	-	.10	.12	-	-	0	.09	-	-
Municipal	-	-	-	-	-	-	-	-	-	-	.19	.39	.16	.18	-	-	-	-	-	-	-	-	1.00	1.00
Transportation	.09	.17	.06	.11	.80	.69	.81	.68	.95	.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	.70	.59	.13	.03	.06	.03	.10	.11	*	*	.06	.25	.11	.04	*	*	.05	.02	.35	.73	.01	*	-	-

*Totals may not add to 100 due to rounding errors

*Less than 0.005; greater than 0

Table C-30

ANALYSIS OF GROWTH OF SELECTED POLLUTANT DISCHARGES
FROM SELECTED SOURCES IN REGION 10

(1990 Value as a Multiple of 1975)

	Part.	SO_x	NO_x	HC	CO	BOD	SS	DS	NCSW	M-W	I-S	S-S
Food Processing	-	-	-	-	-	.41	.19	-	-	-	1.90	-
Pulp & Paper	.67	1.31	-	-	1.31	.11	.23	-	1.36	-	1.45	-
Industrial Chemicals	1.23	1.24	NG	NG	NG	NG	NG	.02	1.29	-	1.63	-
Other Chemical Products	NG	-	NG	1.01	-	.26	.65	0	1.39	-	1.76	-
Steel	1.59	NG	NG	NG	NG	NG	NG	.02	2.05	-	2.44	-
Crushed Stone	.27	-	-	-	-	-	NG	0	2.17	-	1.72	-
Non-ferrous Metals	NG	.30	-	-	-	-	NG	.05	1.20	-	-	-
Fabrication & Basic Products	-	-	-	NG	-	-	-	0	-	-	NG	-
Coal Mining	2.11	NG	NG	NG	NG	-	.02	1.74	-	1.36	-	-
Crude Petroleum & Nat. Gas Mining	1107.88	NG	3.63	NG	NG	-	NA	-	-	-	-	-
Petroleum Processing	1.31	1.12	1.75	2.04	1.81	NG	*	-	4.01	-	1.85	-
Electric Utilities	NG	NG	NG	NG	NG	NG	NG	5.93	NG	-	NG	-
Industrial Combustion	1.07	2.64	2.74	3.41	3.43	-	-	-	24.96	-	NA	-
Municipal	-	-	-	-	-	.57	.77	-	-	-	-	2.77
Transportation	1.63	1.85	1.06	.48	.41	-	-	-	-	-	-	-
Other	.70	.24	.54	.59	NG	1.22	.22	NG	1.00	6.58	.93	-
Total for Region 10	.82	.96	1.22	.57	.46	.28	.67	.19	2.25	3.20	1.89	2.77

Key: NG - Not given when sector accounts for less than .005 of regional residual release for both years examined
NA - 1975 value is 0; 1990 value positive
* - Less than .005; greater than 0